Progress and Profit *for* Mill Men

By HENRY D. MARTIN

Maxime J. Prette

"AND John was clothed with camel's hair, and with a girdle of a skin about his loins; and he did eat LOCUSTS and wild honey."—Mark 1:6

"JOHN'S MEAT."

The fruit of the carob, or locust tree, from which Gum Tragasol is derived.

"AND he did eat locusts and wild honey." —It is somewhat startling to know that the locusts which sustained John the Baptist in his long sojourn in the wilderness of Judea are used extensively today in the finishing of textiles.

It has been the popular idea that the locusts on which John fed were the insects that infested that country in clouds, this idea being strengthened by the fact that in Matthew III:4 they are referred to as meat ("and his meat was locusts and wild honey.") "Meat" in this instance, however, is synonymous with food.

John's locusts were the fruit of the carob, or locust, tree (Ceretonia siliqua), which grows plentifully in Mediterranean countries, and especially in Arabia. The long locust pods were John's meat, but it is only the kernel of the bean that is used in the finishing of textiles.

The locust kernel which is thus used contains 86 per cent. of a natural gum which is without color, taste or smell, and which reduces to a tough, aqueous jelly of absolutely neutral qualities, and one that mixes and combines freely with starches and other ingredients used in sizings.

There is little question but that this gum, which is now known as Gum Tragasol, was used by the ancient Egyptians to dress the yarns of their marvelous textiles and that it was a factor in the preservation of these cloths for thousands of years.

While the present use of Gum Targasol in textile finishing and sizing may represent the revival of an art long lost, its present day uses are as much more numerous and wonderful than those which the Egyptians made of it as has been the development of the textile industry since the days of the Paroahs.

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NOTE.—The story of "John's Meat" has attracted so much interest, and we have had so many inquiries for copies of this, and for the locust beans, that we have had both the story and the natural beans mounted attractively on heavy cards, as above, and will be pleased to mail them to anyone who will take the trouble to send us their name.—Danker & Marston, 247 Atlantic Avenue, Boston, Mass.

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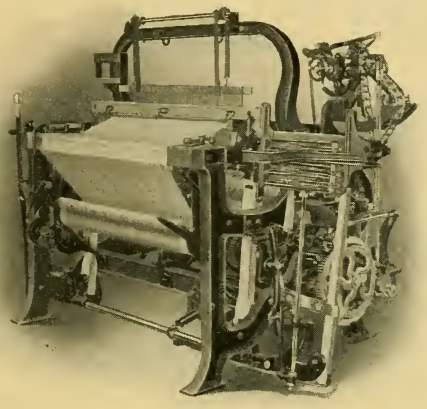

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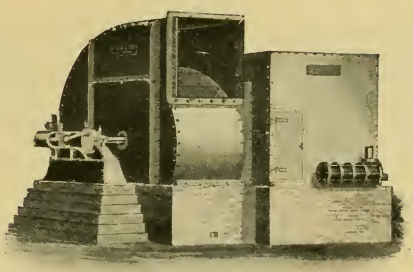

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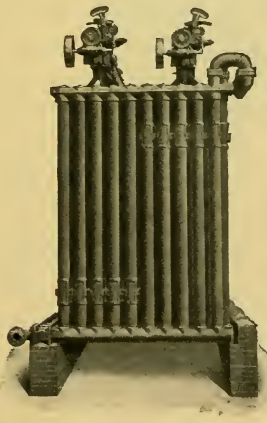

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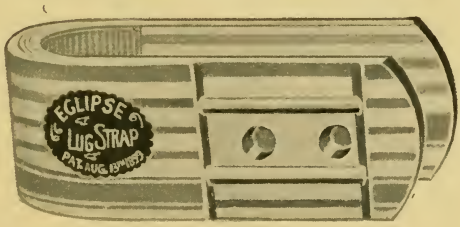

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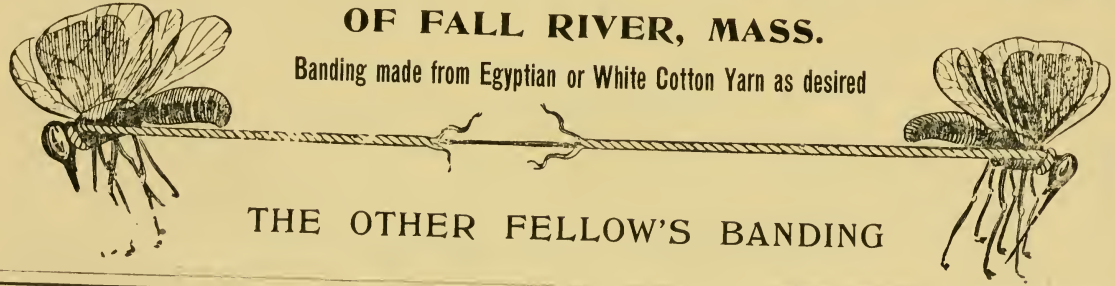

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TEST OF CLING-SURFACE

In Mill of I. E. Palmer, Middletown, Conn.

Fitchburg engine, 300 H. P. Steam at 130 lbs. Cards taken September 6th (P. M.) and 9th (11 A. M.) weather fair.

Friction only - - - - -	94.5 H. P.
Full load - - - - - -	299.4 H. P.

Friction load is 31.6% of total.

As Spinning Department takes most power, we make our test on that Department. We run 7,884 spindles and using 89 H. P.; spindles per H. P., 88. Belts in Spinning Department, 600 feet 2¼-inch single leather.

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"Last September I decided to test Cling-Surface for all my belts to determine the actual saving. First I took cards of my engines to find total and friction load as above. Result: Total 300 H. P. Friction load 31.6% (Time, Wednesday afternoon and Saturday noon). I then treated all belts on face with hot Cling-Surface, until pulley showed stain and no more. This was repeated regularly for four weeks as each belt showed need of it. Each Saturday for four weeks all belts were painted with hot Cling-Surface on back liberally. Then all treatment was stopped for four weeks, at which time cards were again taken.

"Result: A reduction of 8 per cent. in friction load. But during these eight weeks these same machines have turned out an increase of 200 pounds of cotton yarn per week. All belts run slack; weather never affects them; damp Monday mornings have no influence, belts and machines starting up much easier than before; bearings are all cool and grade of yarn is better because of even speeds.

"We also notice that belts require much less attention. For instance: 36 short belts, driving spinning frames, and running up through the floor: we were formerly constantly tightening them, now these ever shifting belts run quite slack, need no attention and never slip; belts have cleaner faces, reject dust, owing to Cling-Surface not being sticky and absence of static electricity in belts. The belts had a little Cling-Surface occasionally until January 25th, when a third card showed 3 per cent. further reduction in friction load, 11 per cent. so far, and I believe we will reach 15 per cent. at least. The belts now need less and less, as they are becoming filled, and I am convinced that they will last very much longer than before."

H. D. MARTIN, Supt.

Report January, 1909, Cling-Surface still in use and perfect satisfaction.

HENRY D. MARTIN

Progress and Profit for Mill Men

ILLUSTRATED

BY

HENRY D. MARTIN

Author of "Successful Management of Cotton Mills." Member of The National Association of Cotton Manufacturers

Published by
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Clinton, Massachusetts

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PREFACE

The first volume on Successful Management in Textile Mills has been so well received by the trade, and so favorably commented upon by mill men and the press throughout the world, and its success has been so complete, that the author feels justified in publishing another volume with the hope that it may be as well received and prove as helpful to mill men.

In publishing this second volume of valuable papers on management in textile mills particularly, the author is pleased to offer it to the public under the name of *Progress and Profit for Mill Men.* Although written from a cotton manufacturer's point of view, many of the chapters on Power, Prevention of Waste, Value of Floor Space, Management of Help and other subjects of economical management, are applicable, with equal force, to any kind of industrial plants.

Every intelligent man wants to make some progress, from day to day, in his life work, and the right kind of man is one who also enjoys seeing others profit. As a rule the man makes the most headway who not only works hard at his trade, but who also reads all he can about his business, and keeps posted on the progress of his trade by keeping in touch with the outside world through the different writers as their publications appear from time to time.

This book is intended for all classes of mill men who want to show better results to their principals, and rise

thereby. The young mill man wants to know how he can become a better assistant, or how he can become a more valuable overseer to his company. It is the same with the superintendent, agent, manager, treasurer or president, all are anxious to make money for their mills and for themselves.

This book is full of practical ideas and various textile problems worked out, showing how any man, disposed to improve his opportunities, can make remarkable progress and profit for his company, and, thereby, for himself. He must take good care of others first and his reward will surely follow.

Manufacturing plants require men who not only know the processes, but men who also know how to economize; those who can spend money wisely; take good care of machinery; properly hire help and prudently manage them. This book shows how the young man may grow in this direction, and the man higher up in authority will also find many reminders that may strengthen his usefulness to this plant, to the help, and to himself.

Special attention is called to the chapters on: Operative Value of Spindles, Cotton Manufacturing Economy, Homogeneous Service, The Value of an Executive, Power Values and Economy, Economy and Supplies, Floor Space Economy, etc.

HENRY D. MARTIN.

Clinton, Mass., March 26, 1909.

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*COTTON MANUFACTURING ECONOMY

Economy in cotton mills is receiving a greater amount of consideration nowadays than at any time within the history of the trade. There was a time when the ability to make the goods predominated. At that time the market field was much larger in proportion to the mills operated, competition was slight, speed of machinery was slow and progress slower. Men were content to make a staple line of goods and make them *good*. Production did not enter the plan. Too much *quality* was the great daily watchword. It was all quality and less novelty. Managers concentrated their skill on the quality and left the questions of novelty, economy and progress to be threshed out by the next generation. Building materials were cheap, water powers abundant, help plentiful, profit margins large, and the "one-idea" man larger still. This is a picture of things as they stood a generation back. Today the large manufacturer lives in a different world. Conditions have changed and he has to grapple with many other problems which now bear upon the trade. While it is essential that he knows how to make the goods, he must also be a born economist. If economy is not born with the man, he must have it borne into him. For want of this trait of character many mills of today do not progress. As we study our subject further we find many problems to occupy out attention now that did not burden our predecessors along this line.

Power

As the mills enlarged the water powers were found inadequate, and the man of today studies how he can secure the highest efficiency from his coal pile. He begins by observing the firing at the boilers He takes up the matter of proper

* Published in The Textile Bulletin.

adjustment of his engines, takes an interest in proper lubrication without wasting oils, and will not allow belts to be over-tight. The banding of machinery receives liberal attention. Over-tight bands consume more power than is realized by those who have not looked into this matter. Then the matter of having all shafting and machinery properly set and levelled makes a great difference in the amount of power consumed. Let a manager give these power details a liberal part of his time and he can greatly reduce his power expense account. In some of our large mills the steam leaks alone would run a small mill if utilized. These leaks are many; they will be found at the slashers, poorly packed valves, warming water at the sinks, loose pipe joints, over-heating the mills, turning on lights too early at night and not turning them out early enough in the morning. All these wastes consume just so much more coal. To illustrate our points further, in a modern mill it is possible to run all the spinning machinery and all roving machinery in the carding department with only one or more lines of shafting, according to the width of the mill, without having a single counter-shaft. This offers a great saving over an old mill which has a counter-shaft for every two or four machines in the mill.

Floor Space

The matter of floor space is now of more importance than was once considered. With the increased cost of building materials the value of a square foot of floor space has proportionately increased. The idea now is to make every square foot of floor space pay its way. When the same cost only about $1.10 per square foot (including shafting, belting, plumbing, lights, sprinklers and heating system) the alleys and vacant spaces were much more prominent than at present. Now that the cost is much more, every space should be put upon an earning basis.

Supplies

A mill must have supplies of a vast description. There is not a mill that could not get along with less. How much

less depends upon the economical ability of each hand in the mill. This is a matter of training. Help become wasteful in proportion to want of training. A broom or brush that can last one week longer should not be replaced. Properly assigning supplies and holding a certain person responsible for a particular broom or article goes further than anything else.

To keep the bulk of supplies in a store, and a reliable man in charge and who also keeps account of where they go, is the only way to do. Getting out of supplies is as disastrous as having too much—either is false economy.

Properly purchasing supplies is a trade that calls for dollars and *sense*. To overload the store is as poor judgment as it was in the case of a man who purchased a pig for $7.50 and fed him $10 worth of corn fast as he could eat. He wanted to fatten it quickly and well. He succeeded and sold the pig for $9. He made $1.50 on the pig, but lost money on the corn! There is a moral to this: Do not waste your judgment; you might run short of it and have to borrow some.

Carrying away supplies from the mill is a small business in two ways. This needs more watching than thought of. Shoe tops, sewing machine oil, shoe lacings, wire, nails, batting, etc., are all necessary supplies at home, and sometimes find their way out of the mill. Look into this for your own benefit.

Wastes and Reclaimings

There is no business in which there is so much opportunity to prevent waste making as in the cotton manufacturing business. From most mills there is much more good material carried away in the waste bags than there should be. If any mill man doubts this statement let him examine his waste house and see for himself. Let him cut down a waste bag of each kind of waste and have its contents laid out on the floor to be reassorted, and he will then see for himself the true condition of his waste house disposals. It pays to do this. From a spinning and weaving mill the run

of valuables that get carried away is about like this: Loom bolts, loose nuts, washers, wood screws in great variety, empty and full bobbins of yarn, any amount of clean wastes of all kinds. If this waste went into the bags containing clean waste the mischief would only be one-half as bad, but a great deal of this clean waste gets into the sweepings and is sold as such. Some of the waste dealers have a hardware department where is gathered a large assortment of mill supplies which are kept on sale. And all the time the mills are purchasing new supplies to replace those thrown away.

Then there is a vast amount of good spinners' waste and other wastes which can be reclaimed before it enters the waste house.

Internal Trafic

A great deal of attention is now given by mills concerning the internal traffic or conveying of empty bobbins and stock from one process to the succeeding process. Where this has been done by boys and trucks run on the floor, methods are now being introduced in some of the more progressive mills whereby no matter is conveyed by hand, or trucked on the floor, that can be made to operate automatic ally either by gravity wherever possible, or by belt conveyors. This affords a great saving of time and labor. There are great possibilities in this line of devlopment by those inclined to provide this better way. By this method spooler boxes, spinning frame creels and roving frame creels are always free from empty bobbins and their appearance a great improvement to the mill.

Management of Help

Lastly, the modern management of help is a great study. The men who are making the greatest success of mills today are those who have a good following of help and know how to take good care of them. A mill is never stronger than its workers. The workers represent the strength of the plant, and that strength will be in proportion to the proper organization of the help from A to Z. Help is now not plentiful; they immigrate oftener and are more difficult to train. It

requires great tact to get them fully interested and to train them to make good work. But a good overseer under a wise management can hold his help and make good help from raw material, and also train his poorer hands to be quite efficient. He needs to know how to place them to the highest advantage. The overseer will give the greatest efficiency who can operate a set of machines himself—one who *can* take hold when necessary and show in a courteous and encouraging manner just what can be done with a set of machines by the very complaining hand itself.

Where help are shown what they can do themselves by an honest, hard-working man, who takes a solid interest in his business, loves the welfare of humanity, and takes deep-seated pride in the progress of his community and the world at large—where these kind of men work, success labels the plant.

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* THE PROGRESSIVE YOUNG MAN

Every young man who starts work in the mill naturally wants to get all the pay he can, to start, but he little realizes how little service he can render at times to earn a fraction of what he gets at first. There is so much misunderstanding about our young aspirant's attitude and his start to learn the trade, that a lesson on the situation may enlighten him on his future prospects.

Important Considerations

In the first place let it be faithfully understood that the place where he starts is not so important, as is the *manner* in which he *takes* hold of the job, and how well he keeps at at his job. Still it is necessary to decide at what point in the mill he will start. The way to decide this is to break in at the point where one's inclination is best adapted. Since men from any branch of the trade have an equal chance,

* Published in Fibre and Fabric.

there is not much to figure about on this score. What is meant by this is that any man who learns how to be a good carder, spinner, weaver, designer, dyer, finisher, mechanic, book-keeper, etc.—if he learns his particular branch thoroughly and studies well the relation of his position to the other departments, and studies what he can about all the mill—his chance is as good at one point as at another; for superintendents and managers have been selected from any one of these branches. Therefore, the young man has this to console him at the start, viz: that he has an equal chance and that he will not be wasting his time wherever he strikes in, if he does his best to learn his part of the trade.

A Mistake to be Avoided

He must not make the mistake of thinking that his part of the business is the only important branch of the mill. Many men make this mistake at a serious cost to their future welfare. This point of view is *narrow,* and hurts the man who entertains this idea. The man must be broad-minded enough to consider that his work is important only in proportion to his conducting same with the proper bearing that it must have to the other departments. That is, no branch of the trade is complete in itself, and every process must be interwoven with the great whole.

Now we have this matter of a start straightened out beyond a doubt, start at any point you please; learn it well, do plenty of good work, and this settles the whole start.

Now, as to the pay; this is an important consideration, too, but not so important at the start as our young friend would have us believe. Take all you can and be *satisfied.* Remember that you often do not earn one-half of what is paid.

Sound Advice

This is sound advice. A young man must know that his prospects are worth more than he can earn at the start. He must keep his prospects in view before him, and bear in mind that he must take this as *full* payment for what he thinks he

ought to have at the start. If he will do this, he will find before the end comes that his average pay from the beginning is not meagre.

We will illustrate this so well by a chart that the young man cannot get away from the facts in the case.

Case of Two Young Men

The best way to show up our project is to take the case of two young men and follow up their careers for twenty years, both starting at the same point and having an equal advantage to gain a fair future.

No. 1 man had asked for his job early in the morning at starting time, and was willing to start anywhere, to do anything; would take 75 cents per day to start, and trust his boss to do the advancing. No. 2 man strolled into the office in the middle of the forenoon and called for the foreman, taking him away from an important task which afterwards cost the company many dollars. This department was short of help, and although this young man would not start at less than $1 per day, nor be willing to do all kinds of work, he was put to work on the easiest job there was. Following is their record for twenty years, as shown in periods of two years at a time:

RECORD OF NO. 1 MAN.

No. of years.	Age.	Pay per day.	Positions held.	No. mills worked in.
1-2	18	$0.75	Back boy	1
3-4	20	1.00	Doffer	1
5-6	22	1.50	Section-hand	1
7-8	24	3.00	Section-hand	2
9-10	26	5.00	Overseer	2
11-12	28	6.00	Overseer	2
13-14	30	10.00	Superintendent	3
15-16	32	12.00	Superintendent	3
17-18	34	15.00	Superintendent	3
19-20	36	20.00	Superintendent	3
Totals,				3
Average,		$7.42		

RECORD OF NO. 2 MAN.

No. of years.	Age.	Pay per day.	Positions held.	No. mills worked in.
1-2	18	$1.00	Back boy	1
3-4	20	1.25	Doffer	1
5-6	22	1.00	Back boy	2
7-8	24	1.50	Fireman.	3
9-10	26	1.60	Watchman	3
11-12	28	1.50	Yard man	4
13-14	30	1.75	Mule spinner	5
15-16	32	...	On strike	5
17-18	34	1.50	Mule doffer	6
19-20	36	1.50	Mule doffer	6
Totals,				6
Average,		$1.26		

At the end of twenty years No. 1 man was earning $2.9 per day, making an average of $7.42 for the entire period of his mill career. But he was always willing to do his part and more. He never complained unjustly; he was a good listener and did all he could to make his boss comfortable.

No. 2 man was entirely the opposite of No. 1 man. He was a chronic kicker. If he was consulted about bad work, it was always blamed onto the "other fellow." His interest in the work was careless. Sometimes he would have a spell of goodness; but as soon as he felt smart he asked for more pay, or if the overseer of his department, or the superintendent spoke kindly to him, he would immediately ask to be promoted, and if he could not get what he thought was "his rights" at once, he would quit and find himself working for less pay elsewhere. At the end of twenty years we find him working for $1.50 per day, and his average pay for the entire period was $1.26 per day.

Both of these men got what they looked for, and what was natural, under their conduct of affairs. What was the loss of one was the gain of the other. No. 1 man worked in only three different mills. He was promoted in the first two mills in which he worked, and never made a change unless he could do much better, and then it was with the best wishes

of his former employes and associates, while No. 2 man changed at every whim that suited his fancy, and left his undesirable trade-mark in six different mills and all to no good purpose.

Let every young man who reads this article reflect and figure for himself which is the best way to start in business—with *dollars* or with *sense* as the most important consideration.

This is not an exaggerated case; but simply an average example of prevailing conditions.

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*HOW TO GET A BETTER POSITION

Every ambitious and intelligent mill man outgrows the past and has an innate longing to do better work in his present position by securing such results as will bring him larger salary and advancement to a higher station. If, perchance, he has reached the highest position in the gift of his present employer and has outgrown the present capacity of his plant and perceives no sign of enlargement, he has a right to look for a new field of labor suited to his ambition. There can be no reasonable objection to this. There are a large number of men who are amply capable of filling larger and more responsible positions with great credit to themselves and increased profit to the companies who would be fortunate in securing their services. But, alas! there is another class that is equally anxious for advancement and seeking the same opportunity with as much force as the former class, and when given a chance prove to be failures. This is what makes it so hard for the worthy man to prove his claims. To get the job is a serious task. When a position is thrown open the rush of applicants is so great, and the pressing of their suits so earnest, that it is often with great difficulty that the most competent men secure an audience or even get a hearing or a reply. It often happens that an incompetent man may have had more schooling, and

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by his polished application may use more convincing terms and secure more favorable attention. Often a thoroughly practical man is so busy at his present task that he hastily sends a message on a scrap of paper saying he is the right man. The receiver throws this message into the waste basket before it is half read through, not realizing that this man may prove greatly superior to the more diplomatic job-seeker.

One of these expert job-seekers once called to see a prosperous friend who was superintendent of a large mill, and as the superintendent escorted his visitor leisurely through his great plant, the visitor thought to himself: "This superintendent has a snap;" and he finally ventured to ask the question, "What is the hardest thing you have ever had to do in connection with this plant?" To which the genial superintendent replied: "Well, I'll tell you, the hardest thing I ever had to do in connection with this plant was to get the job."

There is more truth than fiction about this answer. To many practical men the work of straightening out the mill is very easy, compared to the sever strain of trying to get the job they are well fitted to fill.

The reader will despair if the writer closes this article without some practical suggestions that will aid the honest seeker of a larger job. In the first place, to avoid disappointment, do not look for nor expect advancement at home or elsewhere until you feel entirely worthy and fully competent to fill the higher position. No matter how well a man has done, more and better work will be expected of him in the higher sphere. The next thing for a man to do when his ambition is worked up to that pitch that he wants to rise is to make the job that he now has to do a good deal of talking. Don't talk too much yourself, but make your results talk. It stands to reason that if a man is capable of filling a better position he should be able to fill the one job he has next to perfection. Therefore, take a deep interest in your present charge. Redouble your efforts to increase production and quality and to reduce cost. Get your name up by

piling up production, by your excellent management of details, and keep up this steady gait without wavering. Let your wishes be known in a moderate way. Disclose your object to a few friends here and there in a quiet way. Tell them that you are not working like a Trojan for glory, but you are working for promotion. Register your name with some good bureau. That talk about having a pull with the directors, or of having financial influence does not cut ice. Men are what corporations are looking for, and if you are the man they want, pull and money backing don't figure in the proposition at all.

When you hear of an opening write and ask for it. Tell them you want the work and are capable of carrying out your contract. Don't tell them you know it all. Be honest in your statements and prove them. If you are out of a job try to meet them and have a plain interview, carefully giving honest particulars. To perjure one's self into a position will prove of no value in the end. If you hold a good position, say so, and that you are giving satisfaction, but want to rise. If possible, interview your present employer and elicit his assistance. He ought to be your best reference and recommend you most highly. Write a plain letter. State your experience fairly, be brief and to the point. Use good conventional business paper. This method goes further in getting the job than anything else. Try it for yourself and see the result.

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* THE MAKING OF A MILL MAN

What there is in the making of a cotton mill man is a theme which amply repays investigation. Although the future and stability of a man depends largely upon his grasp of his opportunity and the retention of his experimental ground work, many men are made or unmade according to the acts of their superiors.

Are you a maker of men? This is a question which every

* Published in The Textile Bulletin.

manager of help should ask himself. This matter is worth devoting a great deal of attention thereto. It is a duty owed to mankind, it repays and there is a vast deal of satisfaction in this achievement.

Show us a man who has helped other men upward in their positions and you wlil produce a man who has friends, benefactors, happiness, and, as a rule, great success himself in his trade.

There is no largeness about a man who is narrow-minded on this theme, and who narrows down his help. The largest and most successful men who in any capacity govern help, are those who become interested in their help, and who show them how to work *well* and *up*; who encourage every ambition to grow more deeply interested in the firm's welfare, and never turn a man down and out nor reprimand a man until they are certain that his conduct merits the medicine to the full. They give every hand a chance to reform and do better who shows any inclination to win out. And, if a hand has done wrong and becomes repentant, gives him also a chance to retrieve himself and restore his footing. Many men today are suffering for want of "one more chance" to redeem themselves. This country is short of help and suffers the more if some are kept out by an unforgiving overseer; and sometimes whole families are barred out because there happens to be a black sheep—so-called—in the fold.

Show us a man who is a maker of men and as a rule you will notice that he has a following of good help and plenty of help at all times. It is all in the tact to handle the individual cases upon their individual merits. It is a well known fact that a man can have a row with any hand he has at any time; and some men cannot avoid rows and are never out of one. They live in that atmosphere and drag themselves through life on this wise. But it is found that these men are not the most successful. They do not fill the largest and best positions and are usually very short of help.

As this subject grows upon us it opens and unfolds greater possibilities for both the ordinary help and the foreman. Observe any man who has been in charge of help for

years and has been prudent with them, and who may now be in charge of a large plant; you will find that he has help with him today who have been long and faithful in his service. He has help who not only greatly admire him but who pull with him and work harder for his interests each day they live. And furthermore, these hands do not need to be watched by him, nor to be followed by secret lights. The reason for this is because this manager is a *maker* of men, and their benefactor. There are many men today who can well point with pride to the men they have helped to make and place higher, either under their own management or sent to rise with other managers.

But, alas! there have been other managers of whom it can be said to their shame that they have never helped a man up. They were all the time looking out selfishely for themselves. If a man had a fault, instead of helping that man to overcome that fault, he was fired and went down and out, while a degree of diplomatic assistance might have uplifted that man and this same man thus treated would have shown his gratefulness by doing more for his master than a dozen subsequent incumbents could ever possibly do.

Remember the man now at work; hold no eternal grudge against him for some of his mistakes. Tell him plainly, if you must or it seems best, that you do not like his mistakes; they grind out troubles,—says you, but says you again: "I like you and I know that you can make good; now forget the trouble, let's throw this aside and start this thing right again." As a rule men who are thus treated will steer mighty clear of such a trouble again, and your man learns your style; he knows how to cater to your own weaknesses and he learns how to make the band play even when the great cornetist is sick abed. That is what counts in this world.

Many a man is today holding down his great plant well to success because he has a trained army of men and help in general who know his largeness for not only a brief period; but many have served him for years perhaps in previous mills, and they know that he appreciates their every effort.

The management of help today has grown to be a great

science, and it is unfortunate that this science is unknown and not recognized in any of our colleges and textile training schools.

The art must not be looked upon as one which only requires a watch dog. A governor of help must be more than a mere watch dog, and he must not graduate into a bulldog either.

The best advice to give in connection with this grand achievement, is for a man to learn his business thoroughly from A to Z first, and do so unselfishly all the way. Make friends of the surrounding hands at the same time. And when our working student has his first degree of authority thrust upon him, the first thing to do is to state plainly what he wants and then *show* his helpers *how* to do it and then *see* that it is done. These three great principles must join hands to force the issues or there will be something wanting.

Would you be great? Then be a maker of men at your trade. Remember the principles that must govern this achievement. First, thorough knowledge of the business; second, willingness to work and show others; third, attention to details.

The man who is so narrow-minded that he thinks he will lose his job if he teaches others what he knows, knows too little to deserve our attention. It is contemptible. The man who is thus conceited should go to school again and stay there a long time and learn enough so that it will take him a long time to teach all that he knows to what he calls "the other animals."

Are you a maker of men? If you are, then no doubt you will gain your full share of promotion and success, also win and hold the esteem and confidence of your workers and the masses around you, and the world will give you a prosperity that cannot be purchased with gold.

*THE CAPACITY AND WORTH OF A MAN

The amount of work that a man can do varies with the man and his opportunity to work. If we measure a man's capacity by the work of his hands alone, the work of the average man can easily be computed and laid out; but as to his directing powers, that is an entirely different proposition. This problem cannot be placed in figures. There is no legal or arbitrary standard by which a man's executive capacity can be limited. The limit can be reached only in the individual himself. We know that with his hands he can run only one wheel-barrow at one time. But by his tongue or directing power he may, by ably delegated assistance, operate millions of wheel-barrows.

In regard to the textile trade this force has the same relative significance. While one man is finding all that he can do in the management of a small mill, another man finds no more than he can do in managing more than a score of mills.

What is then the economic solution of this problem?

Is there a limit to the number of mills that a man can manage, and what should be considered the capacity and worth of a man with reference to this question?

In order to answer this question it is necessary to measure the man. Ordinarily a man who knows his trade finds enough to take up his time within the confines of his domains; be it a very small or large mill or an aggregation of mills that occupy his attention. The fact that in any case the man can only keep busy and can no more than do a day's work, in a large measure aids to determine his compensation so far as the actual amount of work he has to do is concerned.

That is, the remuneration does not increase so much on account of increased work as it does on account of increased responsibility. It is the responsibility that is chiefly considered in increasing the salary of a man who takes up more work than ordinary. For instance, if a man is managing a mill at a fixed compensation, and he is asked to manage

*Published in Fibre and Fabric.

another mill along with his previous plant, his salary does not double. This is because his work does not increase very materially. It is only his responsibility which is seriously affected, and even a share of this additional responsibility must be delegated to others as a rule. Thus we have the reason why a man's salary does not increase in proportion to the increased dimensions of his plant.

If a man is running a very small plant, he may busy himself by doing some of the office work, or he may oversee one of the departments, or even do some of the repairing, if he is of mechanical ability.

If he is operating a large mill he will devote his entire time to observing and inspecting his plant personally and superintending the main details with close attention. But if he is managing an aggregation of mills and which may be spread over different territories, he is obliged to deelgate his powers and read the reports of his branch managers. There is practically no limit to the number of mills that a man of brains can control. It depends entirely on his organizing ability. It is the organization that counts. The true worth and capacity of a man lies in his ability to organize a strong managerial force of help. And this applies to the small plant as well as to an aggregation of plants. The strength of the man at the head lies in the strength of his organization. The strength of the official machinery represents the worth and capacity of the manager. His compensation depends on this strength.

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*THE MILL MAN'S SALARY

As this is a question upon which dwells the young man's mind to a considerable extent, and as there are so many young men rising in the textile industry, a chapter which may aid them in throwing some light on this theme may lead them to better understand their future prospects.

At the outset, it is only fair for all concerned to state

* Published in Fibre and Fabric.

that while the young man who seeks a chance to train his ability at the bench, so to speak, expects a fair living compensation at the start, he should remember that the opening up of the chance itself is worth more to him than any initial salary which an employer can afford to give. He should also realize that his employer in giving him a chance to learn most always finds that during the first few months' service, his uselessness, the time of valuable men spent in showing him how to apply himself and the work spoiled by his inexperience, are three things which must be added to the cost of his salary which is literally paid at a loss. The reason why the writer shows up this quartette of cost items in connection with his first opening, is because the beginner overlooks his opportunity and merely keeps his mind's eye on the fearfully small (?) salary he is getting, and often even conspires to see how much less or how little he can do for receiving such a small (?) salary.

Few young men ever realize that they must not only get where they are worth all the salary they get, but that for a long time they must be actually worth more than their salaries in order to repay their employers for the opening and the preliminary costs of establishing their calling a success. Were not these facts borne out in experience by all who employ help, it would be really necessary to charge a young man so much a week for the privilege of being given an opening to start, and learn his trade.

How often it is the case that young men begrudge their small pay, and as soon as they get where they think they are worth a little more, will rush to the office for a "raise."

The writer is driving at a lesson which many young men should learn. The young man should look farther ahead for the interest on his investment. A job is like a farm. The job is an opportunity. So is the farm. The remuneration or returns varies with the amount of work that is put into the opportunity and also as to how well that work is applied.

With reference to the salary, let us give an illustration to prove our assertions. Here is a young man who is full of push and wants work around a mill at anything that he can

do. He is told that he must work at the least a week, for nothing, to learn a few things. Then he is given $3.50 a week for the first six months and thereafter $4.50 for the balance of the year. Now we will assume that our young man is fairly ambitious and that he never "kicks," but does as he is told. We will say that he started to work when 16 years of age (which is young enough to commence to work out), and that he advanced in position from time to time, filling all positions from "bobbin boy" to the management of a mill.

We will also assume that on an average he gets a raise in salary of $2.00 a week each year, and that he follows the service during the useful period of his life, say until he is 65 years. At 20 years of age he is earning $12.00 a week; at 24 years he is getting $20.00 a week; at 34 years, $40.00; at 44 years, $60.00; at 54, $80.00, and at 64 he is justly earning $100.00 per week, and no one begrudges his salary because he always keeps his earning capacity ahead of what he gets without complaining. He realizes that he must earn for his company much more than what salary they pay him in order to receive their advances.

If, perchance, his salary should seem large for the amount of time and work he puts into the company's works during his declining years, no one kicks, because his present advice is still of great value and he is now paid for the good service which he gave when in the 40's. He was worth just as much salary then, but did not get it. He preserved and waited for his returns and got them without fail. He knew he could not afford to kick anywhere along the line, for, if he took one step backward he might lose his goal and ever after work for small pay.

Here is the most intersting problem of this story. Our character commenced work for nothing and then got very small pay. But on the whole how much pay did this man average per week during the entire period of his service? The answer to this question is,—that our young man has never worked for less than $50.00 a week during the entire period of 48 years that he worked, and we will make him an allowance of $144.00 for his first week's work during which

time he was supposed to earn nothing. Or if you prefer to leave his "learning week" out, he averaged exactly $53.00 per week for the entire period when he retired at 65 years of age.

Young man, the above is an illustration of facts; facts to which many men can testify as true experience. It is simply an example in dollars and sense. Be thankful for the opening. Don't find fault if you have to work one month for nothing or a year or two at very small compensation.

The foregoing simple example illustrates the point.

In regard to being obliged to leave the firm one is working for to get promoted, this is purely a matter of good judgment and depends more upon the individual than upon the firm he is serving. It is generally known that many men who are managing their own manufactories, advanced to these positions without ever leaving the firm from the start. It depends a great deal upon conditions. As a rule, firms would like to promote many of their hard workers very much, but having no immediate opening and not having openings for all who deserve them, are glad to recommend them for advancement in mills of other firms, when possible. A man's employer is usually his best friend along these lines, and a man does not lose ground by taking his boss into his confidence so long as the man who seeks a higher place takes good care of his present work through thick and thin.

To advance, a man must not only make his work do a great deal of the talking, but it is well to let one's wishes be known in some suitable way to his boss, who will assist him. The writer got promoted the fastest with the firm he remained the longest; having been given his first superintendency after about four years of hard labor, and remained with this firm altogether about nine years.

*FLOOR SPACE ECONOMY

With the increased cost of building material during the last few years, all who have had to do with erecting new mills, or enlarging their old plants, have given close study to the value of floor space. Floor space costs now a great deal more than it did a decade ago or so, so that everything which takes up floor space is being so made and laid out as to take as little of it as possible. Builders of machinery are improving their machines so as to take up less floor space, and also endeavoring to increase the capacity of their ma chines in order to require less machinery, and thus utilize less floor space, or giving more room for other machinery, or giving room to expand the capacity of any particular process.

To give some examples in this line, the modern revolving flat card does not take the floor space that two of the old style top flat cards take, but it can produce a great deal more work than three of the "old timers," when required, depending upon the kind of goods wanted, of course.

The same can be said of the modern spindle which has increased in speed from the common spindle at 6,000 revolutions per minute on 30s yarn to 9,000 or 10,000 revolutions per minute, giving us instead of 80-100 of a pound per spindle of warp yarn, 1.25 pounds or so. All this has increased the product per square foot of floor space, and at the same time has increased the income per square foot.

The new warp tying-in machine which is being introduced into cotton mills is doing even more toward liberating floor space for other uses than any other machine of its size has ever done.

So much, then, can be said for the building of machines that take less floor space by virtue of their being made more compact, and also for improving them so that by greatly increased capacity less machines of the same kind are required to produce a given quantity of goods.

For the former requisite, we must look entirely into the

* Published in Fibre and Fabric.

building of the machine. Upon the capacity of the machine two things depend. The machine must not only be made right to give a larger production, but it must also be managed right. It is a well-known fact that the product per square foot depends very largely upon the organization that follows up the details incident to securing a full production. This varies with different factories.

Another very important matter which affects the economy of floor space is the proper arrangement of the machinery, and in lining up each succeeding process in such a manner that all stock keeps moving as much in a straight line ahead as possible. In a plain goods mill this is much easier to accomplish, but in a varied goods mill, this is not so easily done. The goods have a more varied movement. However, in all cases, it requires clever management and the best of judgment to arrange all machines and processes in such a way as to utilize the least amount of floor space and get the best results obtainable.

The amount of floor space that is required per machine varies somewhat with different men. Some men always have room enough, no matter how cramped or close the machines are set, while other men never have room enough, no matter how liberal the management has been in giving room to move about. And, in exceptional cases, if a machine was placed in the middle of a hay field some men would be still looking for more room with which to surround it. It merely goes to show that not all mill men fully appreciate and do not realize the value of floor space.

Of cases known to the writer, there are two small mills in which it was thought that, if not impossible, it was hardly worth while to rearrange the machinery and put in more. But when there came a strong determination to take hold of the hard work and do something, the capacity of each of these plants was increased about ten per cent. on the same amount of floor space then in use, and upon which it was at first thought not worth the while to try to expand. It should also be taken into account that not only an additional amount of business is done on the same floor space, but on

the entire output of these plants there is a margin of reduced cost by utilizing the spare floor space.

Some large mills have also greatly benefited by re-arranging their machinery and increasing the production per square foot.

This important matter brings itself more prominently before the mind, when represented by or reduced to money values. We will suppose that $100,000 is invested in floor space. Now it is reasonable to suppose that the projectors of any business expect more than banking interest on their money. We will then certainly expect that the floor space will be so utilized by the machinery put upon it that it will earn, at least, six per cent. interest upon the total investment. Let it be borne in mind that spare floor space or idle floor space does not earn any money. It is only the work that is done upon a given amount of floor space that gives it value or earning power, and it is only in the proportion with which floor space is utilized that its returns can be banked upon.

Now we will suppose that the machinery could have been properly arranged on $90,000 worth of the floor space mentioned, or ten per cent. better than was planned. Then it must be taken for granted that $10,000 more was put into floor space than was really needed. The machinery is thus saddled with the necessity of earning six per cent. interest on $10,000 which was not required in the business. Reversing the scheme, it is evident that had the machinery been properly laid out with a view to bringing out every economy, there could have been ten per cent. floor space available for extension of the business, and which would in turn have enabled the company to manufacture the entire output at a reduced cost.

It pays to look well after the floor space. Have none of it idle. It is valuable only in proportion to its utilization by some earning power agency.

Another evil which idle floor space brings about is that it permits of collecting and piling up, not only waste materials, but, in many cases, much valuable yarns, and such things

are allowed to be laid aside and carried along until strength, colors, styles, assembling, etc., are gone and the once-good-stuff becomes waste itself after all, and which was never intended at first.

It pays to keep the floor space clear and alive with much business and wear it out. Nobody will find fault if the floor is worn out profitably. It is better so than to have the floor wear out a good business and have nothing but the floor left.

Beware of installing cheap floors. The cheapest floor is a good floor—one that is hard, solid and firm and capable of standing the strain and hard usage. A shaky, flimsy floor is unfit for machinery to rest upon.

Referring again to the wide variance of floor space used per spindle among different mills, it may be interesting to give some figures to illustrate. Of several modern yarn mills ranging from 5,000 to 50,000 spindles, the floor space ranges somewhat proportionately from 4 square feet per spindle in the smaller mills down to $3\frac{1}{4}$ square feet in the larger mills. The general average shows about 3.60 square feet per spindle.

Taking nearly 50 spinning and weaving mills (spinning and weaving their own years), and all fairly modern plants, the range is about 3.15 to 7.10 square feet per spindle. The general average shows about 5.15 square feet of floor space per spindle. The average difference, then, between a yarn mill and a yarn and cloth mill combilned, is 1.55 square feet. That is, it requires about 1.55 square feet of floor space additional per spindle in a cloth mill using its own yarns. In other words, the looms require 1.55 square feet more per spindle to use up the product of a yarn mill under average conditions.

Now that we have an idea of general conditions it is not out of place to state that when it is observed that a yarn mill is occupying a floor space of 5 square feet or more per spindle, or that a cloth mill has 8 to 10 square feet per spindle, it is exceeding normal demands. They have room enough to install much more machinery, or they could partition off the extra space and start a skating rink. It would unburden the earning power of the machinery!

Our reader may ask what is the least amount of floor space that can be utilized by a specified plant; give an example. The best figures ever noted by the writer were those specified for a print cloth mill of 40,000 spindles; all ring frames; 1,120 looms with 3.30 square feet of floor space per spindle. The same plant, with 40,000 spindles, but the filling spun on mules and 1,000 looms, would require 3.45 square feet per spindle. Thus the mules provide for 120 looms less but required 6,000 square feet more. Incidentally it might be stated that the latter mill, owing to the advantages of having mule spun filling, would make as much money, if not more, although requiring less looms and more floor space, because the same mill could make a finer and better selling grade of cloth than print cloth, if desired.

From what has been said on this subject, it can readily be seen that this is another important mill problem which cannot be left to work itself out. The man of brains looks out for this. It is unfair to expect that one mill can earn what it would or as much as another mill if it is carrying along $10,000 worth of "dead wood" in unoccupied floor space.

Keep the floor alive with business. It is not very profitable to keep it just to look at.

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*ECONOMY AND SUPPLIES, OR DOLLARS AND SENSE

While the march of events has led us to practice closer economy than has ever been known in the textile industry, there is another question which, in its place, should receive the attention of managers.

To what extent help takes supplies from some of our mills is not generally known. Yet, that it is done to a certain extent is well known. The kind of taking which is referred to here does not come under the head of stealing, in the legal sense of the term. But what is referred to is the countless

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ways in which a certain class of help feel that it is a privilege to help themselves. And it is in this way that the matter leads up to asking ourselves quite a list of questions something like these: How many coffee grinders, sewing machines, bicycles and other things that require oiling are oiled by corporation oil? How many shoes are re-tapped with corporation belting—old and new? How many bobbins, good or bad, are kindling morning fires at the company's expense? And so the questions come up in various ways—too numerous to mention. When this class of extravagant help want a piece of twine, a lump of clean cotton, some yarn-waste, basting thread, wood screws, nails, pieces of rope, wire, boards, pencils, paper, pens, tacks and a whole catalogue of supplies, where do they all come from? If no measures are taken to overcome this, in a pleasant way, and some managers do not miss anything, the vast majority of conscientious help hold their breath and whisper, how long can this last? Why should some hands be left to feel that almost anything that can be had by taking, is theirs, while those who trod the path of rectitude and have strict consideration for their employer's goods, pay one hundred cents on the dollar for everything they get and never take away a prize package?

There is a remedy for this—by no means small—expense to many corporations. The people who do this do not want to be dishonest. It is only the lack of education for the consideration of what rightfully belongs to others that causes this. If just so much money were left hanging around, it would make some difference; for they would not touch that. Supplies, nevertheless, is money in another form, and they help themsleves to these things. Keep the bulk of all supplies in the supply-room, and allow only such supplies to go out that are called for by the responsible heads stating for what they are required. The soft-snap man comes to the front again and says: "The cure is worse than the disease." The hard-worker for his company's interest cannot agree with that kind of talk. He labors under the general principles that $100 honorably saved for his company in one way

is as good as saved in another way that is right. To remedy this evil does take more time and care, and the success of the effort teaches others that owners have a right to their own goods and to protect them. In these days of close competition no system of economy is too good to enforce. The hardest duties are easy to perform when taken hold of with determination. If a superintendent can save his company from one to ten dollars per day by establishing a more perfect system of giving out supplies, he should do so at once. Economy of this kind injures nobody, adds to the wealth of the world, and makes better times for all mankind.

But it takes tact to carry out any good system. It is only a poor system that can run itself. There must be behind and ahead of every good system a firm, level head to carry out that system. This is necessary because many men make excuses who believe their excuses will "down" the issue, floor the superintendent, and carry them through another period of laxity of pushing a good form of government in the mill. If the man would look forward, he could see that after the harder work of getting a good system started, he would have a far better time in running his department.

To illustrate one of these besetting excuses. A superintendent spoke to an overseer about curtailing expenses. This was a well-managed mill, but the superintendent was attending to his business, nevertheless, in making proper inquiries about this matter. When, to his surprise, the overseer said: "Don't you think that we are doing as well here as in other mills?" To which the superintendent replied: "I do not look at it in that way. We must look at this case upon its merits. We want to watch our own plant and do better than the other mill if we can, and let the other mill take care of itself." This conversation saved the company $1.00 per day in this department alone from that time onward, and nobody got hurt. There was no fighting about it, either. All that is required is a definite plan and a strong, kind determination to carry out that plan in the best broadest way possible.

Of leaks in an ordinary cloth mill, where things are not watched, which can be attributed to employes helping themselves, the most serious one is that of using cloth remnants. In a certain mill this was found to be so serious that it amounted to several bales of cloth annually. A large proportion of the men used the cloth for socks, handkerchiefs, sweat-bands in their hats, towels and for wiping machinery. The women folks used the cloth for aprons, headdress, padding stool-seats, towels, etc. The trouble with this mill was that the cloth-room was merely a sort of dry goods store where cloth could be had for the asking in any amount. Nobody seemed to care where it went, and, worse still, the mill was not on a money-making basis at that. This is an extreme case, but there are many places where cloth is still wasted in more or less quantities in the same way. Waste of this kind is cruel to a mill, and one of the easiest to eradicate. The way to stop this is to order that all cloths from weaving departments be positively sent to the cloth-room. And the cloth-room management must be instructed to never give out cloth to any person in the mill without proper orders from the office. After this, any deviation from this rule should be treated upon its merits. No person in the employ of the corporation has any right to deal out its goods of any nature to the help without proper authority and consideration.

Let every manager sift this matter down for himself as he sees fit. Loss from this source foots up high in the aggregate and is worth clearing out.

Keeping tab on the production figures, starting with the cotton put through the mill, and watching the wastes sent out, will reveal any undue leaks that may come from cloth disappearances. All wastes should be accurately weighed and carefully assorted and grouped. It repays well to be alive to all these things.

ECONOMY IN THE USE OF RING TRAVELERS

In these days of excessively close competition, and when the steam hammer of the directors would fall upon extravagance of every nature, why not look up the matter of ring travelers? No item of supplies enters more freely into the textile mill than that of ring travelers, and no supplies are so wasted, and so little done to prevent it. If it is prudent to practice economy in some respects surely it is prudent to do so in all others. And yet how many of our mill managers protest at the loss of ten cents here and there and are blind to the heavier losses hither and thither. How many managers are there who know positively just how many travelers they require to keep their mills in order for a year or any given time? But, how are you going to find out? will say some of the gentlemen of the easy chairs. The conservative manager who keeps figures and averages before him can easily answer this question. Let any manager who would like to post himself, look up his traveler bills for one year, and many a one of them will find that he buys travelers enough to change them in his mill from once every day to once every week. Of course, a mill making several kinds of yarn and changing numbers a great deal, will consume much more ring travelers than a straight goods mill, and coarse goods mills need to use much more than fine goods mills. On numbers below 20s (cotton yarns) and running proper speed, the traveler should be changed once in three or four weeks. This means to remove the old travelers and put on a new lot of the same numbers. This keeps the work running well and more than pays for the time taken to change and cost of new travelers. The squad of hands that change travelers, as a rule, are very wasteful. There should be a person of good judgment to follow each squad and serve them with travelers. Young boys and even some men care little or nothing about the cost of travelers or anything else. If allowed to help themselves, they drop them on the floor and frequently overturn a whole box on the floor. Or

they take too many in the hands at one time, and as they proceed to change from ring to ring the travelers drop between their fingers and are lost; as it is impracticable to pick them off from the floor one at a time. The only economical way to change travelers is to have a trusted man serve each boy and give out only small portions at one time.

Another place where a great waste of these goods occurs is at the supply pans fastened to spinning frames As a rule too many travelers are put into these places. The result is, that when spinners need a traveler they find an entangled mass of travelers, and in securing one, two dozen or so are dropped into nowhere in particular, never to be found useful again. This can be overcome by simply putting only a few travelers in the bottom of each pan, care being taken to shake them out well so that a single one can be easily secured by any thoughtless spinner. Is the cure worth the precaution, is asked? If from $50 to $500 per year is worth saving in the proportionate plant, then, the disease is worth the cure.

ECONOMY IN THE USE OF OILS

Oiling machinery is a matter that does not receive the attention it should in many textile mills. This is evidenced by the fact that most any mill manager would frankly admit that his oil bills could be scaled down considerably if only the proper amounts of oil were used in their respective places. Any man competent to judge can easily ascertain for himself about how much oil and lubricating compounds is required to keep his plant in good running order for a given period, and let him compare this with the amounts used, and he may find that from 10 to 50 per cent. more is consumed than is actually needed.

There are two ways in which this can be ascertained, and it is well to utilize both methods so that one way can be a check or proof of the other.

One method is to go through the plant and take a list of all bearings and classify them under their proper headings,

stating what oils or greases are to be used at each heading. Now add each column and multiply each total by the minimum portions allowed each group, and the result will not vary much from what should be used altogether. The other way is to organize the oilers. Have as few oilers as possible, and be sure that they are as reliable as can be secured and men who will take a deep interest in obtaining close and correct results. Put a resolute man in charge of the oil repository. Have all the different oils and compounds properly placarded and for what purpose they must be used.

All lubricants used should be dealt out by this man personally and recorded in a book and charged against each person served. Following the organization further, put a man in charge of the shafting and heavy bearings, letting him have what helpers he needs. Another man should be placed at the head of the persons who oil the spinning spindles and carry the system all through until the organization is completed, somewhat as follows:

Departments.	Responsible Heads.
Oil room	
Engines	
Shafting and water-wheels	
Picker room	
Carding room	
Spinning spindles	
Spinning room—general oiling	
Weave room, etc	

Each head should be carefully instructed, so that he knows just what oil to use and keep account of all he uses and report quantities used every day at the office. Keep up this system for six months and then compare with old methods, and the system will become a permanent organization by virtue of its great economy over the old way.

The trouble with the oiling under present go-as-you please, nobody cares system, is that a great deal more oil is used than is really needed to prevent undue friction. It is surprising what a small amount of oil a bearing requires when the right oil is used and the same is put where it belongs. This can be proved by the fact that many bearings

running today have their oil holes so plugged with waste and dirt that, of the daily splash of oil spilled somewhere near the right spot, only one per cent. ever reaches the bearing. A heavy per cent. of oil is spilled onto the floor in every mill. The wrong oil is frequently used. If too heavy oil is used it clogs the bearings. If too light oil is used the most of it runs out without lubricating. Often oils are used where a good grade of grease would answer much better and go further than oil.

Under the other extreme it often happens that an incompetent oiler does not oil all places required, or puts on insufficient oil. Sometimes his poor oiling goes on indefinitely until there is a wholesale wearing out of the machinery. This not only entails expense to replace worn out parts but loss of production while machines are being repaired, making double loss to the company.

The reader of this article must not construe same to mean that it requires more help and complicated attention to oil a plant properly, as indicated. There is no doubt that the oiling can be done much more efficiently; pass through less and better paid hands; and yet the labor cost be less. The saving in lubricants consumed, and wear and tear prevented are the great economical factors to be considered in overhauling the oiling system of the present.

In these days of close competition no system of economy is too good to enforce. The hardest duties are easy to perform when taken hold of with a determination. If a superintendent can save his company from one to ten dollars per day by establishing a more perfect system of oiling he should do so at once. Economy of this kind injures nobody, adds to the wealth of the world and makes better times for all mankind.

*ECONOMY IN SPOOLING

Because the process of spooling in a cotton mill appears so simple it does not receive the full share of consideration that is required to maintain a high standard of results. Like the picker room and the drawing frame processes in some mills, because they are simple, apparently, the spooling is also neglected. The writer has devoted many chapters to the former two processes, showing the need of strong devotion to the management of these departments, and will now confine this paper to the care and management of spoolers.

The first thing about a spooler that is neglected is the matter of sufficiently oiling. This machine, being made up of slowly moving parts, it requires some convincing terms, at times, to the section boss, to prove that it does require oiling once in a while! Let many managers look into the matter of oiling spoolers and they will find that rocking shafts, mangle gears, heart motions, and spindles are fast wearing out for want of oil. This carelessness takes up valuable power in the aggregate, and as the machine has a rickety motion all through it injures the best intentions of having well spooled yarn. The yarn is not well laid on the spools; and a wobbly spool will yank and jerk the yarn at every turn and strain it so that it will not work well in any of the subsequent processes. There is a third consideration that ought to convince the management that poorly oiled spoolers means a big repair or renewal account in proportion to the simply outlay for such machinery.

A drop of oil skilfully applied at each bearing, a small piece of tallow or Albany grease placed on the mangles and cams, and spindles that are oiled periodically, will cause the machine to run smoothly as a watch. But too much oil is also to be avoided, as the machine will become gummed, and drippings or flying oil from spindles will stain the yarn.

Cleanliness is another virtue to cultivate. If the machine is not kept clean, flyings will become wound or drawn onto the spools, making bunches and unclean spots in the work.

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The lifting rods should be kept free from lint. Many breakdowns, and uneven spools are caused from lifting rods getting stuck; and then the ultimate results are waste and bad running work.

Knot tying is the one great question which had perplexed the managers of the spooling room until the knot-tyer came to the rescue. The knot-tyer ties a positive and uniformly small knot, providing the machine is kept in working condition. Of course the knot-tyer is simply another machine, and, like spooler, requires the same treatment with reference to oiling, cleaning and proper setting. If the knot-tyer is not cared for accordingly, it will in turn wear out quickly and make poor work, and the one peculiar trouble about this machine is, that unless the user gives it proper care and watches to see that it is working well, it will go on all day making as uniformly bad knots; causing misery in the warping room. That is, the knots may be made too short or incure, and slip asunder.

A word with reference to housing these machines in place when not in use. Each machine should have its regular user, and, each machine should be put in its respective pigeon-hole at night and locked within. They should never be left around the spoolers when not in use.

The trafficing of bobbins is an interesting point to consider. In many mills the old way of handling bobbins is still in vogue, and that is to have the doffers come from the frames with their trucks to empty the full bobbins into a fixed spooler box and refill their trucks with empty bobbins. This method is bad because it takes up much valuable time; chafes the yarns more; makes some snarled bobbins; and wears on the fixed boxes. The latest and best method of trafficing bobbins is to have flat car trucks, on which can be placed a box having two compartments; a small compartment at one end for the empty bobbins, and the larger compartment for receiving the full bobbins as doffed. After having doffed one or more sides, the doffer proceeds to the spoolers and instead of emptying the bobbins from his truck he places the entire box on a fixed platform at the spoolers.

This platform takes the place of a fixed box. Now the spooler tender proceeds to load the bobbin-holders and as the bobbins are emptied and removed they are simply placed into the small end of the box which was emptied at the spinning frame when same was doffed. In this way, it is never necessary to re-handle bobbins. This system works well enough when spoolers are paid by the side. If spoolers are paid by the piece, or by the hundred weight, a better way is to doff into single compartment boxes that hold 25 or 50 lbs. net, and place these onto stationary platforms at the spoolers. By this method, to get rid of the empty bobbins, it is an excellent plan to have bobbin conveyors fixed to the spoolers that can convey the empty bobbins to a centrally located bin. If this bin can be so built that bobbins will fall or gravitate into the doffing trucks it also pays that much better. The doffing trucks in this case have a fixed empty bobbin compartment on them.

Building the spool is an important consideration. The traverse motions should be so adjusted that they may be filled evenly without running over and they should oval out well at the middle of the spool. To accomplish this is very simple and yet many spooling departments suffer for want of properly adjusting the traverse motion. The traverse motion should be shortened about one-eighth of an inch at each end of the spool, and the spools will then round out well without running over at the ends. Good firm spools can be built in this way if care is also taken to have even tension and not so severe as to injure the yarn. The speed of the traverse motion must have a share of attention. In most mills they run too slow. It is claimed that more yarn can be run onto the spools if the speed is slow; but in practice it is learned that a fast speed traverse puts on as much yarn as compensates enough more to offset this claim. A traverse motion that changes or reverses quickly will build a much better spool and one that is far less likely to run over at the ends. Over-filled spools can be prevented by having the back board adjusted so that spools can be filled only so full, the complete idea being to reduce wastes to a minimum and have uniformly filled spools.

Handling the spools in such a manner as to reduce breakages is desirable. Spools should always be handled like eggs and never tossed into a box. A close examination of this will reveal much destruction of valuable property along this line.

Wastes should be kept separate for each hand and weighed against them. Each kind of yarn should have a set of spools the heads of which are painted or marked a distinctive color. Only one end should be marked so as to show which is the right side up of the spool. This facilitates creeling at warpers, also starting empty spools or spool pieces at the spoolers. If spools are not marked thus, there will be a great deal of mixed yarn as a rule where different sizes of yarn are made, and there will also be a great deal of reversing in unwinding; i. e., the spool while starting to unwind in one direction will reverse before running out. Each spooler-tender must have her spools crayoned a certain color to prove her work.

The thread guide must be adjusted closely enough to prevent the passing of bunches, etc.

From what has been covered by this article it can be seen that the spooling process is not so simple as it appears, and that careful management of its various details will abundantly repay the plant.

THE OPERATIVE VALUE OF SPINDLES, OR EARNING CAPACITY

The operative value of spindles is not a difficult problem to solve, yet the frequency with which spindles are stopped here and there on the slubbers, speeders, spinning frames and mules, lead to the conclusion that there are scores of people who do not realize the full value of a productive spindle. Of course the productive value of spindles has a wide range of variation. It varies with the quality and number of the yarn spun, the speed and style of the spindles,

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the supervising facilities, and finally with the margin of profit at which the product is sold.

Spindles are only means to an end. They convert roving into yarn in just the proportion they are kept operative. Idle spindles are worse than non-production, for they bring about a two-fold loss, loss from retarded production upon which a profit cannot be made, also a corresponding loss in the increased cost of production obtained from the remaining productive spindles.

To illustrate this, take a plant of 10,000 spindles which, when fully operative, produce 10,000 pounds of yarn; let us assume that for several reasons 200 spindles are idle all the week. The loss of production will be 200 pounds of yarn. If the product of this mill is sold at a profit of two cents a pound, the unearned profit would be (200 times .02) $4.00. If the pay-roll of the spinning department is $200 per week when all the spindles are running the cost per pound for spinning will be ($200 divided by 10,000) 2 cents, but if there are 200 non-producing spindles the production will be only 9,800 pounds. The pay-roll being the same, the cost of this production is increased to ($200 divided by 9,800) 2.04 cents per pound, making an additional loss of .04 cents per pound, or about $4, which, when added to the other $4 mentioned as profit which would have been earned, makes a total difference of $8.00.

The mill, with all the spindles running, could have earned $8.00 more profit than when 200 spindles were idle and the help paid to keep them running. Carrying this rate along for a year we have (52 times $8) $416, a total deficiency of about $2 per idle spindle for the year.

Another illustration: If a plant of 10,000 spindles has a capital stock of $200,000 and the average production per spindle is one pound per week, with the product selling at a profit of 2 cents per pound, the plant will have a profit of about 5 per cent. on its capital, and the true operative value or earning power per spindle will be $1.00 for the year. But if for any reason 200 spindles fail to produce anything for the year there will be 4 per cent. less profit, or 1.5 of 1 per cent. less profit on the entire capital stock.

In view of these facts it is clear that idle spindles are not wanted in any mill. The profit of the plant must be derived from the product of the spindles. Idle spindles or spinning frames for which help are being paid to keep operative are not like spindles which are not in the mill, because nothing is paid out to keep spindles idle that are not owned by the company.

There are numerous causes for idle spindles, such as broken bands, dry bolsters, waiting to be doffed, breakages in machines and plant, waiting for any kind of supplies, such as bands, roving, rolls, stirruph, guides, oil, bobbins, belting, rings, travelers, waiting for power, stopped to be oiled, back ends neglected by spinners, etc. To show how fast this counts up, take a day's record for an example: Total running time for 10,000 spindles for one day is ten hours. Suppose that one spinning frame of 200 spindles is stopped for two hours for a broken gear because the gear had to be made before the frame could be started. This is equivalent to having 40 spindles stopped ten hours. Owing to the inefficient band boy there were on an average 25 spindles stopped for ten hours. The doffers were too slow and caused two frames of 200 spindles each to be stopped two hours or 80 for ten hours. Unattended back ends stopped 10 spindles all day. Spinners stopped frames needlessly, which equalled 50 spindles stopped ten hours, making a total of 200 spindles stopped all day. If this is repeated every day the results at the end of a week are as already outlined.

The remedy for preventing this loss is to impress upon the help the value of keeping all spindles on an earning basis. Keep the frames doffed, never have two frames stopped to be doffed at one time. Have plenty of supplies on hand. Keep the bands tied on. The spindle is the life of the plant; keep it alive; make it turn off work. A dead spindle is a serious loss; it would be better to bury it and forget it.

* THE REVOLVING FLAT CARD.

Obtaining the draft of the modern carding engine is an interesting study for our rising would-be carders. To the trained carder this is a simple subject, but in these busy times there are many young men, who, having given little or no study to this question, find it a puzzling problem to solve. Not all can afford the time and price of a special course of study either in textile schools or even by correspondence, and their superiors in the mills are too busy men, nowadays, to conduct homespun lessons to fit every case, or to lay out a curriculum to fit all cases in general. But a good textile paper is within the reach of the humblest seeker of knowledge concerning his trade. And, laying aside the young man, there are yet many gentlemen of the old school, in power, who obtains drafts by first getting speeds and diameters of feed roll, cylinder, doffer and calendar roll, the same as they once did with the old style self or hand stripping top flat card, and leave out the draft incident to the coiler which they find on the modern card and which is considered unimportant by them. Leaving this item out does not give the correct draft. Our elder friends are too old to enter school again, and they like to see the methods dis cussed in their favorite textile paper, and gladly adjust th mselves to the latest ideas.

There is still another class of readers who know it all. They have nothing more to learn; but when they see a subject analyzed in their textile paper, they cut it out and pass it to some young man in whom they are interested. Therefore a lesson as to the proper method of securing the correct draft of a card either theoretically or absolutely may be of use to all interested in the trade.

Both the theoretical and the actual draft have their place in the manufacturer's category. The theoretical comes first because the manufacturer, when making his purchase of cards, wants to lay out the range of his draft at this stage of the process. If he did not order the card geared properly

* Published in Fibre and Fabric.

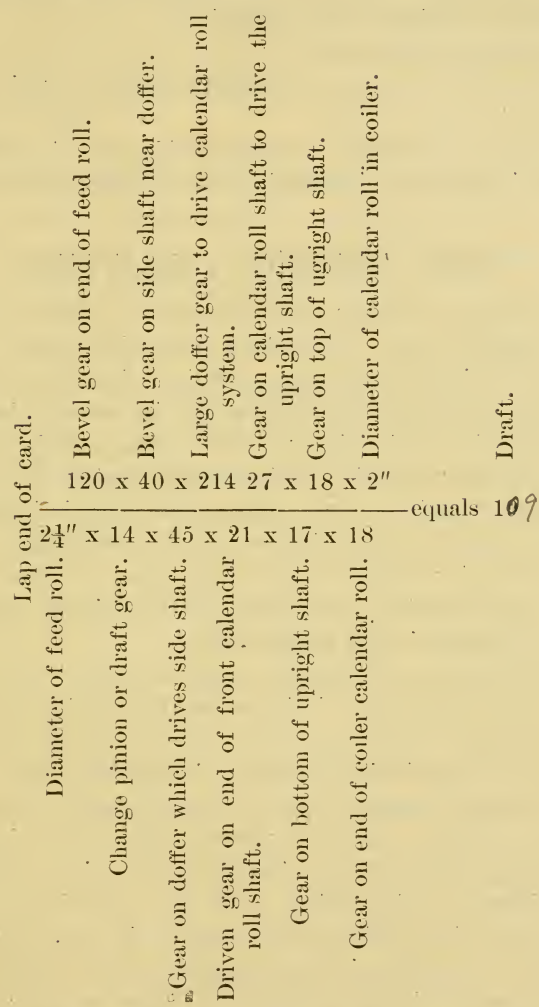
he might not be able to obtain a certain range of draft suitable for his line of goods. The actual draft is the theoretical draft corrected or adjusted to local conditions and varies chiefly with the amount of waste that is removed by the adjustment of the card. This draft is the easiest to secure and the most practicable to work from. It shows the percentage of waste made, and this is the reason the actual draft is always more than that shown by the mechanical movement, unless in figuring the mechanical draft the waste that may be removed is guessed nearly right.

To obtain the actual draft: Weigh a lap to ascertain the ounces per yard. After weighing the whole lap, weigh several yards more from the same lap to verify the total result, also to see about how much variation there may be from yard to yard. We will suppose that the lap fairly averages 10 ounces per yard, or 4,375 grains avoirdupois. Now if the weight of 10 yards of card sliver averages a weight of 40 grains per yard, then 4,375 divided by 40 gives 109.4 draft.

To find the theoretical draft is a more complex problem. Taking a common make of card, proceed to arrange the various factors as in cancellation. Starting with the feed roll we will arrange the factors in their successive order until we reach the end of the calendar roll of the coiler, and will name each factor as shown on next page.

Of course this example can be carried a step further by starting with the lap roll instead of the feed roll, as some do. But for all practical purposes, starting with the feed roll is quite sufficient. No doubt there should be, to advantage, a very small percentage of tension, pull or draft between the lap roll and feed roll. It would not do to have the lap unwind faster than the feed roll can take it. But if we were to split hairs on this theory we would be obliged to go back further than the lap roll for our information complete; for some wise theorist might suggest that the draft might vary while the lap gained or lost moisture while on the card, and that it should be weighed, both before and after starting, to get accurate results. However, the leading

men are quite satisfied to quit when the decimal point has reached three or four places.



The above arrangement, together with the name of each location, gives a plainer illustration of the example than is usually given in lessons of this kind that are published in textile papers or anywhere else.

Another illustration to show how to secure the constant number and our lesson is done for this time.

It must be understood that if we leave out the change pinion or draft gear from our example, the final outcome is the constant number of the card, thus:

$$\frac{120 \times 40 \times 214 \times 27 \times 18 \times 2}{2.25 \times 45 \times 21 \times 17 \times 18} = \text{Constant number equals } 1534$$

To prove our constant number divide same by the draft gear used in the former example, and we have a draft of 109.

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* YARN TENSION VARIATIONS

The matter of tension, with reference to cotton yarns, is a very important one. The stock from which yarn is made may be of the best, the twist may be just right, the machines properly constructed, and the speeds in order; also there may be sufficient help—in fact, everything may be right to make good yarn, but if the important matter of tensions throughout the mill are not right, good work is impossible. The work anywhere runs better if not overstrained. Overstrained work is rendered uneven and weak. It does not run so well, and, therefore, the quality of the finished product is inferior and there is less production.

Then the matter of tensions must be taken up as a great thing to study by itself. It is one of the skillful traits that a good manufacturer must cultivate if he wants to master his trade and get the best results. It requires skill to regulate the various tensions in a cotton mill, because they vary so much. There are so many elements that affect them that only general principles can be laid down when writing to teach others on this subject. If the conditions did not change, of if the tensions were always the same under all conditions, or always the same under certain specified conditions, it would be easy matter to figure out a rule that would fit all conditions; and the science of tension regulating could be learned at a stroke and the game would be over. But, alas! the conditions not only change, but the tensions required are not always the same for like conditions. This

* Published in Fibre and Fabric.

skill cannot be learned like learing the alphabet. Still, men of experience have learned how to regulate the tensions and have this matter down to a science. Experience in this, as in other branches of the trade, is the best teacher, and it is not a misnomer nor a too-high sounding term to call this art a science in itself.

Proceeding with out subject, it is well known that there are many things which affect the strain or tension of the ends or threads as they pass from one bearing, bite or hold to the next point of pulling or drawing through the same machine or in the continuous process. The tensions are affected by the weather—extreme heat or cold, and too dry or too damp; size, speeds and gearing of machines; size and grade of goods, electricity, and lastly by the various tensioning devices themselves, whether regulated by weights, springs or dead surfaces, and sometimes by revolving surfaces; that is, in warping or beaming, etc., the more dead or non-revolving rods, or the more revolving rods or rolls the yarn is made to pass between the more the tension is increased.

Although there are so many variations with which to contend, to the man of experience there is no confusion whatever. He knows their tricks and plays with their fancies much the same as a cat plays with a live mouse. In other words, he plays to win and does so every time. How does he "get on" to these things? He has learned what the cat has learned—that the mouse must not be allowed too much range or it will get away and the game be lost. There are three things with which our would-be master of the situation becomes familiar. He knows that the weather and other environments which surround manufacturing are not always the same; that it is impossible to make exactly a certain number of yarn without the count varying some; and that there is no such a thing as a perfect tension. Each of these three groups has a certain range or limit within which it is safe to operate without straining the work. For example, the manager of a department does not let the atmosphere become too warm or too cold; too dry or too moist. He

watches the thermometers and hygrometers and regulates accordingly. But even if these instruments were to get out of order he would discover it, because he is so accustomed to the temperature required. Having the atmosphere right he has no trouble on this account. In making the yarns he knows that undue variation in the counts is out of place and he must keep the tensions within safe limits. He keeps his numbers right and this leaves him to regulate the tension on its merits alone. By the feel of the threads here and there and by the way the work runs, he can tell the safe limit. The idea is not to have the tensions pull too harsh or too easy. His endeavor is to reach a point one-half way between two safe extremes. Taking the tension on a spinning frame to illustrate, a spinner who rigs up his tension so as to give the yarn all it will stand today is leaving no leeway for the work that may run on the light side tomorrow. Then, again, the stock that may stand a harsh tension today may be a weaker stock next week and unable to stand the strain. On the other hand, if tensions are allowed to be too easy today they will bring contrary troubles ahead.

The evils of improper tensioning can begin way back to the picker room. If the laps coil too fast for the feed of the calendar rolls, it causes split and uneven laps, so that the work of reguating tensions commences at the very start. It is also possible to strain the web and sliver too much as drawn from the card doffer. And then there is a great deal of work over tensioned between the fluted and calendar rolls of the darwing frames, which causes irreparable injury to the work. These places need to be watched. The tensions here are not always the same the year around nor always the same on different grades of stock, and yet some places are never changed from season to season as they should be.

Again, the tension regulating on roving machinery is a delicate undertaking. A skillful man in charge of these machines can accomplish great good for his firm. Strained roving is a bad thing for the spinning department and for the goods all the way through the mill.

It is not uninteresting to mention that it frequently

occurs in a whole room full of similar machines, all geared alike and on same work, that, here and there, some machines require to be treated differently in order to get the same tension, or that some machines have to be given a different tension to run well like the others. This is caused by air currents, electricity, etc.

Another very important matter which bears on this subject is the value of reserving all the elasticity of the yarn that it is possible to retain for the weaving of the cloth. There is no place where the yarn is so strained as in the loom, and it requires some give to withstand the process. Everpthing that can be done in previous processes to relieve the strain on the yarn and preserve strength and elasticity for the loom, repays bountifully.

It is also interesting to study the tensioning to avoid slack threads on warpers, beamers and slashers. The theory, of course, is to have all the ends pulled or drawn alike. It is well known that where several hundred ends are drawn in common from spools or chains especially, unless tension is added that is common to all the threads, there will be some slack threads. If no tension were added the tensions between threads might vary from 1 per cent. to 100 per cent. or more, and it would be impossible to make good running work or even goods.

To reduce the variation is explained in this way. We will suppose that from a creel of spools there are ends pulling all the way from one-tenth of an ounce to one-fifth of an ounce each. We have a difference of 100 per cent. in the pull. Now, if by drawing the ends through the friction rods, bars or rolls, we added a five-ounce tension to each end, the variation in the tension is reduced to less than 2 per cent. Thus the tension is almost equalized.

Strange as it may seem to those who have not looked into this matter, there is also a considerable saving of power, oils, and less wearing out of machinery when all unnecessary strain is removed from all the work in the mill. This also applies to banding, belting and gearing. It is a broad subject. Look into it for yourself and profit thereby.

*UNEVEN YARN AND TWIST.

The term "turns per inch" in yarns, when sifted down to analysis, leads to some very interesting figures. Since it is impossible to manufacture a perfectly even yarn of any number, or of any quality, it also follows that it is as impossible to put in a perfectly even twist in a single thread of cotton yarn. In ply yarns such as thread making, after having undergone the three processes of twisting, and the uneven spots in the yarns have been equalized, the third or final process of twisting shows the evenest twist that can be had and it will be quite even. This is because in uniting two or more ends in one twist, it evens up the threads; that is, the uneven places distribute themselves against their opposites; the fine places match up against the coarse places; in other words, the fine places do not always lie beside the fine places in the companion threads. The same can be said of the coarser spots. But in single yarns is where the more prominent variations come. And the more uneven the yarn, the more uneven the twisting. If uneven yarn did not affect the turns of twist per inch, the problems of the trade would be much simpler—threefold simpler, because the evil of uneven yarn, like all other evils, brings on other evils, and the evils of uneven yarn have plenty of cousins.

The third evil to mention now is the uneven strength of the yarn and subsequently the uneven strength of the finished product, and the poor amount of that product, and so the chain of evidences against uneven yarn grows upon us very fast. Hence the importance of as even yarn as can be secured.

The effects of poor twist and poor yarn go hand in hand first, and then follow other troubles. Even in a good quality of yarn the turns per inch vary considerable, but where it varies from 1 per cent. to 10 per cent. or more in good yarns, it will vary from 25 per cent. to 200 per cent. or more in very uneven yarn, from the standard turns per inch required. Those who have any doubt about this statement can easily

* Published in Fibre and Fabric.

make a test to prove the facts. The simplest test, and one which requires no instruments, can be made thus: Take about 24 inches of any good yarn and place along side of it a black or dark blue thread of about the same size and twist them together. Then take an inch glass and count the turns per inch in ten different inches, and tabulate the figures. Find the per cent. of variation between the extremes, and you will have some interesting figures. Now take a poor thread and treat it likewise and note the contrast between the tests. Of course, if a machine is geared to give a certain number of turns per inch the general average will show closely the number of turns wanted. But the test mentioned will show the variations per inch, also show up the unevenness of the yarn clearly.

Those who have never tried this will ask several questions This is right. There are many things that we can learn or find out faster by asking than by experimenting. There are other things that we can learn better and more thoroughly by working them out and discovering things for ourselves. But it is lost time for any man, and imprudent as well, to spend days and possibly weeks, endeavoring to find a key rule or the principles by which to perform an experiment and solve a problem, when the key can be had for the asking. It is also a matter of courtesy, duty and wisdom on the part of any man to welcome the seeker of knowledge and not turn down the man who honestly seeks it. Help him, if you can, or show him who might aid him. It is like putting money out at interest—it repays before the end comes. Then let us give attention to some of the questions that our reader may ask himself. Of course it is a matter of good judgment, too, on the part of the student, not to ask too much, for the man who "knows it all" might get "stuck." Do not ask foolish questions like the man who was supposed to feed the super's dog while he was away. The super worried for fear his man would forget to feed the dog. So he telegraphed: "Have you fed the dog?" and the man wired back, "Have fed dog, but he's hungry again. What shall I do?" Now let us stick to business.

In twisting the two threads of yarn together which are about 24 inches long, which way shall it be twisted? Answer: It can be twisted either to the right or to the left; both will show the imperfections in the yarn, but it is preferable to twist it reversed to the twist in the yarn.

In making this test, about how many turns per inch is recommended. Answer: About an average of 16 to 20 turns per inch will answer on No. 25s yarn if twisted by hand; finer yarns will require proportionately more. If a black thread is run alongside of a white one in the regular spinning frame making the yarn to be tested, the regular yarn twist might do, but not so well as the lesser turns per inch, which can be put in by hand, and which is easier than changing the gear on the frame to give less twist.

Why does it require less twist? Answer: Because putting another thread with the single you practically double the size and it should not take the regular twist.

How many men do I need to hold the yarn while I put in the hand twist? Answer: You can hold the yarn yourself by putting one end on the floor under one of your feet; you see this is a one-man power job!

Of what use is the test anyway? Answer: This test is very useful in two ways; first, it is possible to note the appearance of the yarn to better advantage without the use of instruments; second, with the addition of the pocket-glass, it is possible to make correct comparisons as to percentage of variations in twist per inch and unevenness in the yarn. In testing the strength of yarns by the ordinary way, it does not show the variations of twist or the variations of unevenness of the yarn, strictly speaking. The yarn being tested for strength alone might be fairly even and yet made from stock that was weak. What is being driven at now is something that brings out the appearance of the yarn to best advantage and makes it possible to figure out comparisons. This simple test accomplishes just that.

Before analyzing a test, it must be explained that if two pieces of six cord sewing thread, one black and one white, are twisted together, the twist will run even and the same

will show no defects such as thick and thin places. This is mentioned to prove that when the black thread is twisted with a single piece of yarn, if any defects appear, they belong in the single yarn being tested and count against it.

We will now analyze a test case. In a fairly good grade of yarn, a careful analysis of ten threads, each ten inches long, shows a variation of five per cent. in the twist it takes to cover them. This variation was caused by three faint depressions or fine places in the yarn and one slight growth or thick place. This 100 inches of yarn then has as follows: Five per cent. variation in twist, 3 per cent. thin places, 1 per cent. thick places, 96 per cent. perfect or normal size yarn. Taking an inferior grade of yarn under the same test, the result shows over 100 per cent. variation in twist, 40 per cent. thin places, 30 per cent. thick places, 30 per cent. perfect or normal size yarn.

In making this test it is best to have a regular piece of sewing thread, for if the dark thread used to make the test has any imperfections it would be unfair to credit them to the yarn being tested. However, if the two threads are made in the same mill, it would give the average condition of what two threads are, when twisted together, but would not show up the imperfections as they really are in each thread separately.

It is a good thing to know how to make these quick off-hand tests, as it gives a rapid method of proving actual and comparative conditions on the spot. This form of test with analysis complete as shown, is herewith published for the first time, so far as is known to the author.

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* MULE SPINNING vs. FRAMES.

Some years ago there went up a great cry against the mule, for which there were several reasons. First, the spinning frame was so improved that it became feasible to spin filling on it. Second, it was supposed to be very much cheaper. Third, there were plenty of frame spinners and

* Published in Fibre and Fabric.

small help to be had from which to train new spinners. Fourth, some of the mule spinners made demands which could not be granted and this was the last straw which drove the cotton manufacturer to the spinning frame as the cure for all the evils which then existed, and the mule had to go. At that time the extent of the fine goods industry was small in comparison to its present proportions, and the spinning frame could compete fairly well with the mule and leave a small balance in its favor. This country being mostly on coarse goods, the frame continued to hold its own until during the past two or three years. During the last half decade or so cotton manufacturing has changed vastly. Fine goods mills have sprung up like mushrooms. Help has become scarcer and scarcer until today we have a "help question" on the board.

The spinning frame has not improved and has practically stood still while the mule has been improved considerably. Fine goods being more profitable than coarse goods, many mills would like to spin finer counts and wish they had their mules back again. Ring spinners are now very scarce, but there are plenty of mule spinners. Mule spinning being largely men's work, plenty of men can be had to train as a reserve force. Even on coarse work when the product of the mule is compared with that made on the frame there is nowhere near all of the advantages which were counted upon at the outset. The yarns cannot be spun so softly on the spinning frame; the yarn cannot be so well conditioned on bobbins as it can on cops from the mule. Cops can be steamed, while steam is fatal to the ring frame bobbin; warping the wood out of shape. And no system of moistening the filling on bobbins is quite as cheaply and as well done as on filling from mules. And the extra cost of bobbins against cop tubes is not to be compared. Mule spun filling is far preferable. More yarn can be put into a shuttle at one time and it runs better. Mule filling makes better cloth and less seconds. There is less trafficing on bobbins and no help required to gather empty bobbins. Cop tubes take practically no floor space for storage room, while empty

bobbins take up valuable room. There was also an argument that it took less skilled fixers to take care of ring frames than mules, but it has been found that it takes as good judgment and skill to keep a frame in good running order as it does for the mule.

So far as the mule wage question is concerned. Of late years this has been very satisfactorily settled by the adoption of the standard price list as adopted by New Bedford and Fall River manufacturers. This standard list is not exactly the same in each locality, but its principle is identical. That is, a standard list is kept on file which is adapted to the locality, and this list remains the same. This is posted, and if the wage schedule fluctuates 5 to 10 per cent. above or 5 to 10 per cent. below, the variation is merely added to the weekly earning when the pay-roll is made up. Whenever there is an increase or decrease the per cent. of same to be added or deducted is posted alongside of the standard list which, as previously stated, remains unchanged.

The method of computing a mule spinner's wages is simple when learned, but complicated, like everything else, to the uninitiated. An illustration, together with explanation, will be of great value to the careful learner. The spinner's price list is expressed in cents and fractions for spinning 100 hanks, and usually has the following provisions:

First—Combed yarns are paid at the price of three numbers less than the average size for the week.

Second—The hanks are figured from actual size or average size for the week.

Third—Anything less than one-half a number is paid at the price of the next full number below; and likewise a one-half number or fraction above one-half number is paid at the price of the next number above—thus 92.25 becomes No. 92, while 92.50 or more becomes 93.

Fourth—The price list includes the pay of the back boy, and therefore the back boy's wages must be deducted from the spinner's wages. The back boy's wages are posted.

Fifth—(In case there is a 10 per cent. raise). The schedule as posted allows the spinner 10 per cent. above the list.

The formula for computing price per pound is as follows: Multiply the number of yarn spun by the price per 100 hanks and divide the product by 100 (hanks). The result will be the price per pound.

Explaining the formula: The number of yarn is the number of hanks in a pound, and as the price is for 100 hanks, the price divided by 100 gives the price per hank; and this result multiplied by the number of yarn or hanks per pound, gives the price per pound.

To make all points clear to our readers, we will give two concrete examples scovering the ground clearly. We will suppose that a mule spinner has spun 400 pounds of 80s combed Egyptian yarn, and that he pays one-half of the back boy's wages. The back boy attends to two pairs of mules, and earns $5.00 per week.

EXAMPLE—FORM NO. 1.

Nominal No. of yarn wanted	90.00
Average size for one week	79.25
Three numbers deducted for combed work	3.00
No. of yarn at which spinner is paid	76
Price as per standard list per 100 hanks	4.27c
Plus 10 per cent increase in wages	.427c
Total adjusted rate	4.697
Rate multiplied by actual size spun	79.25
Equals price per lb	3.7223c
Pounds spun	400
Total amount due spinner and back boy	$14.89
Back boy's wages deducted	2.50
Amount due mule spinner	$12.39

EXAMPLE—FORM NO. 2.

Nominal size of yarn wanted	90.00
Average size for one week	92.25
Pounds spun	400
Total hanks	3,690,000
Standard price for 3 Nos. below 92	4.54c
Ten per cent. added for increase in wages	.454c— 4.994c
Spinner and back boy's income	$18.43
Back boy's pay deducted	2.50
Spinner's wages	$15.93

* SPEEDS, VARIATIONS AND ECONOMY

The speed at which the different machines can be driven in textile mills, and the relation of this important matter to the economic solution of the question, is one which can be studied with great profit by those who would compete with that class of men who use their best judgment in adopting the different speeds to the conditions surrounding their sphere, rather than having an unalterable or fixed speed.

Practical men who look into this carefully, as they study various situations, find that both extremes of "too slow" and "too fast" speed in many places are violated. There are a few things to take into consideration in connection with this subject, and the writer will endeavor to point them out and illustrate briefly the facts.

Overdriven Machinery

First, we will take three cases of over-driven machinery in the three different, most important departments of the mill. Case number one was where a certain system of roving machines was not giving enough roving to supply the spinning department. And from time to time the pulleys which drove these machines were lagged or enlarged to increase the speed of these machines. But the more these machines were speeded, the less production came from them. The increased speed strained the work and the machines so that the work went from bad to worse and the increased stoppages incident to the breakages of the vital parts of these machines reduced the production in a faster ratio than it was intended to increase it. This went on for several weeks until the manager finally decided, after much persuasion, that the speed he had ordered put on now and then was too high. He "gave in" to his carder, and the speed was reduced one-half from where it had been increased. The result proved immediately gratifying. The production and quality were increased at once and the machines ran smoothly and steadily, and good help would stay on their

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jobs and push things. Everything went the reverse of the extremely high speed era, so far as quality, production, breakages, good feeling and such things were concerned.

Another Example

Taking another example, from the spinning department, there was a modernly constructed mill running on medium carded counts. In this plant there were about 10,000 spindles, making No. 30s filling. The spindles were running at a speed of 11,000 revolutions per minute. And the efficiency of this department was a great deal of a wreck part of the time because the speed was too high. Slower speed in this case did a great deal of good towards straightening out the existing difficulties.

To cite another case, where nearly 1,000 looms were running at a certain speed and found to be very much stopped for repairs: They also gave a poor production and a large percentage of seconds. These same looms were run three to four picks slower per minute, and the best of results were obtained from this group of looms.

Other Side of Question

Still there is the other side of this question, to be watched with equally as close care. It often occurs that some machines can stand more speed and more good results secured. A practical man must use his best judgment. The best way is not to be governed by a set standard speed and never deviate from it. The best way is to adapt the speed to the conditions. This does not mean to change the speed from a set standard as found in books or as given by machinery builders' catalogues and change it to suit conditions of today and never deviate from this.

If the conditions vary much from time to time the speed should be readjusted.

Going more into detail with reference to our subject, we will suppose that under normal conditions the given speed works well and no straining of things appears at any point. The work runs fairly well and the production, quality and

all are quite satisfactory. All of a sudden it occurs that a new lot of cotton comes at a time when there are good reasons for its being off in quality and no amount of hustling or handling makes it run better. Some of the reasons may be that the cotton crop is of the shorter variety, i. e., not quite up to length, or there is more refuse matter, or the season's weather has not properly matured the fibres. For these reasons the processes suffer.

Balancing the Difference

A little less speed will so well balance the differences that the help take on new courage and produce as much production as under the full head of steam.

Going to the other extreme, we will suppose that the crop is ahead of itself in all good qualities. There is plenty of help; a good market, and everything slips along well. The help are having more time than ever to loaf around. Now is the time for redeeming the slow speed period. The help were favored through the rough work. Now it is no more than fair that they redeem the period. In fact, it is unnecessary to consult them. Turn on more steam and get a few more revolutions per minute here and there.

And then there are shorter periods when things are unequal. This week the work runs well, but next week it runs badly. It is the belief of the writer that, especially the speed connections of roving and spinning machinery, should be of the cone or variable speed type, so that the push or movement of a lever adapts the speed at once to the daily conditions. This is not to be done by the help in general, but adjusted by the men in charge. This has already been tried in a small way, and by this method the production always leads beyond the one-speed-man proposition.

An Illustration

Then the value of a steady speed that is free from slipping belts and various stoppages should be too well known to tolerate much interruption. As an example, here is an illustration of what a casual stop of fifteen minutes does for—say a room of 1,200 looms. This equals having one loom

stopped 5 weeks or 30 days, and at 40 yards yer day it entails a loss of 1,200 yards in production. Figuring another way, it equals the stoppage of 30 looms for one day. The loss of production brings on a two-fold loss to the plant. First, a loss of profit on 1,200 yards not sold; and, secondly, an additional loss by the increased cost per pound of the lessened production. A stop of one hour multiplies our proposition by four, and we have 120 looms or one-tenth of them stopped all day with a loss of nearly 5,000 yards of cloth production. Therefore, keep the speed rightly adjusted; keep the speed on all the time, and the belts on the tight pulley, and secure the goods.

HOW TO SAVE POWER

The vast power required to propel the machinery in our textile mills and the heavy cost attending same, renders it imperative that every economy be exercised to make a horse power go as far as possible.

When it is reasoned that for every 33,000 pounds or its equivalent caused by friction, there must be one mechanical horse power to raise same one foot per minute, and that under ordinary circumstances a horse power, when raised by steam, costs on an average $25 or more per year to maintain, it is highly important to lay aside every weight and barrier that needlessly increases the load. An organization that does not follow up this matter of power closely may be paying from 10 to 25 per cent. more than is actually required to operate the plant under more favorable conditions. As a textile plant is largely made up of spindles and so many small bearings, unless special care it taken to keep all these bearings clean and lubricated with proper oil, and to see that the tension of bands is not too much, there will be much more power consumed than is actually required.

If any one unfamiliar with this subject doubts the gravity of this statement, let him refer to page 69 of the Draper Company's "Textile Texts," and study the valuable tests given, which were actually made in the mills, and which prove con-

clusively that when a cylinder is cramped bands have too much tension; the oil is of cheap, low gravity; dirt and sediment allowed to remain in bearings; poor bobbins; too heavy travelers; rings not concentric with spindles; top rolls improperly cleaned, oiled, or too heavily weighted. All these things together can make a difference of from 80 to 44 spindles driven per horse power. It is, therefore, essential to have these things right, if a firm desires to get along with a minimum of power. The tension of all belts, large and small, if too tight, will increase friction and consume more power.

Another matter which increases power throughout a plant is to have the shafting and machinery out of line and unlevel. In a new mill, especially, after having run a few months, things will have settled more or less, and all machinery and shafting should be gone over again and differrences readjusted. At the end of one year from second adjustment make another correction. Then every three years thereafter. This keeps the plant in true level and alignment and more than pays for itself in saving the coal pile.

A weekly indication of the engines should be the rule. This will show whatever variations that may arise from time to time, and the cause can be looked up and corrected.

The matter of cleanliness in regard to the shafting and pulleys is another factor which enters into the problem. It is a well-known fact that a pulley with clean spokes can speed through the air with less resistance than one which is filled with mattings of flyings and dust.

The matter of gearing and fitting when changing gears or making repairs is another source of losing power. If gears are set too deeply in general it will take a great deal more power to drive them, to say nothing of the undue wear and tear. If fittings are made too tight when repairing parts that turn within parts, such slowly turning journals that do not give warning by heating, a fraction of waste power can be traced to this abuse.

With water power, where the draught tube system is so extensively used as it is today, there is much loss of power

by air leakages into the water wheel casings. One of these instances came to light not long since, where about twenty horse power had been going to waste for several months, and this twenty horse power had to be made by running the engine, there being a supposed insufficient water power supply.

Another wasteful source is when the draught tube extends or plunges into the water too deeply and not allowing the water to disperse. This was another instance discovered of where the engine had to run to make up the difference. The bottom of the tube was cut off, and then there was power enough not only to run the plant, as equippel, but there was a surplus of power to run some new machinery which was installed.

It pays, then, gentlemen of the fibre, to look well after the power department of a textile mill.

Another matter of vast importance which should not be overlooked under this study, is the matter of belting and transmission rope. The man of the moment must not be merely a manufacturer, but he must know how to take care of belting if he would achieve the most saving of power in connection with a vast plant. A tight belt, for example, is like burning a candle at both ends at once, and worse. It strains not only the belting; it also strains the shafting, bearings; consumes more oil, more power, and consumes vastly more labor to keep up repairs. A strained belt soon grows thin, narrow and too weak to convey power, hence slipping and causing great loss in production and also causing poor work in some of the production that is supposed to be good. Fortunately there is a remedy for this catalogue of evils. The writer has had a thoroughly successful experience with the latest and most scientific method of treating belting. What should be used is a belt filler, and the most reliable preparation is "Cling Surface." It makes poor belting good, and makes good belting better. It fills the belt, giving the face of the belt perfect contact. It does not cake; kills electricity entirely, and enables a belt to do its work while very slack. These points are not exaggerated in the

least. The "cling surface" is not a sticky substance. It is a belt filler, and must be applied while hot from a boiling pot. Just a little on the face of a belt while at slow speed. When the mill is stopped, paint the outside of the belts same as you would the wall of a house. Try this and you will have no further trouble with your belts. It is a belt preservative and not a belt destroyer. No more troubles in starting machinery on damp mornings. No more counter belts running off and pulling counter shafting down. Great saving of power, oils, labor, belting, machinery. "Cling Surface" will do all this and more.

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*POWER VALUES AND ECONOMY ANALYZED

When it is considered that about 400,000,000 tons of coal are consumed annually throughout the world for generating steam, anything touching the economy of the power plant is of vital importance. After deducting a fair estimate of coal consumed for locomotives on land and sea, heating and various other requirements, it is possible that approximately 200,000,000 tons may be attributed to the use of stationary power plants for manufacturing purposes. Assuming that the value of this coal at the place of consumption may average $3.00 per ton, we have the enormous sum of $600,000,000 spent annually on fuel alone for the production of steam for manufacturing purposes. To the intelligent reader of this articles it can be readily understood that anything which can be done to make even small per cent. of saving at each plant, would, in the aggregate, add greatly to the profits of the manufacturers. However, there are hundreds of plants where no care is taken to ascertain their economic efficiency, and it is with such plants, especially, that careful attention to details might reveal intolerable waste of fuel, which could be prevented. Every grade of coal has certain heating values, each of which can be specifically ascertained. This value is based upon the heat units

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that a given quantity will raise during combustion and the amount of water it can evaporate under stated conditions. A heat unit being the amount required to heat one pound of water one degree Fahrenheit, it is known that one pound of pure carbon is capable of yielding 14,500 British thermal units, and if all this heat could be utilized by a boiler, it would evaporate 15 pounds of water from 212 degrees at atmospheric pressure. The greater per cent. of this heat can only be obtained by having the most modern improvements and skillful manipulation of boilers and fuel. What percentage of efficiency is lost can be attributed to one or to all of the following causes: Defective boilers, poor draught, unskilled labor, or a poor grade of fuel. If the boiler plant is first-class, the management equal to its opportunities, and the evaporating efficiency is low, there is something wrong with the coal.

The quality and character of the varieties of coal varies considerably, and at times there is even a wide range of variation in one good grade of coal. It requires as good judgment to select a good and suitable grade of fuel as it does to select the raw material to be manufactured. As different grades require suitable furnaces and grates, it is highly important that these are adapted to the kind selected. Before determining what grade to select, it is best to ascertain and study the chemical analysis of the leading types as given by coal dealers, also learn, if available, what evaporative efficiency is being accomplished by a few successful corporations using them. Having selected the grade, learned its analysis, and having some knowledge of its usefulness elsewhere, it is well to follow up this information by having samples analyzed from time to time by independent laboratories, and also carry on regular tests, wihch will be a proof check on previously given advice.

By comparing these tests, and carefully tabulating these regular and special analyses, it will serve to keep the coal much nearer to the grade specified. The tests of the laboratories will show the varying proportions of the chief substances composing the coal as follows:

Moisture.
Carbon.
Hydrogen.
Nitrogen.
Sulphur.
Clinker and Ash.

An analysis of the clinker and ash will determine the amounts of

Combustible Matter.
Silica.
Alumina.
Oxide Iron.
Carbonate of Lime.
Magnesia.
Undetermined Matter.

The consumer's analysis, although not so elaborate, is substantially the same, but will not show the absolute details. It is called an approximate analysis. Reduced to its simplest form it will show at least the following substances:

Moisture.
Fixed Carbon.
Volatile Matter.
Clinker and Ash.

These analyses combined will show the character of the coal selected. They should be compiled into permanent form for official record, and so arranged that future data can be entered. Thus, these sheets can be extended over any period and taken up at any time to average the results. It is as important to tabulate and follow up a record of the ash analysis as the record of the combustible material. There are several important reasons for this. The record will show whether any combustible material is being thrown out. Loss from this source might be too much. It is well known that some grades of coal having perhaps more ash, will give better results than others having much less ash. The reason for this is, that the grades leaving less ash sometimes made a clinker which had to be removed from the grates with a cold chisel. This kind of ash clogs draught.

To burn well, under ordinary conditions, coal requires

about 12 pounds, or 150 cubic feet of air per pound of combustible. Therefore, it is highly important that the grates can breathe freely. On the other hand, it does not pay to force a boiler beyond its limit. If, with the normal supply of air, the temperature of a fire is about 4,000 degrees Fah., it is not economy to force twice as much air as is needed through the fire, and lower the temperature of the fire 2,000 degrees, taking longer to burn out the heat units and losing more heat in proportion than where the temperature is kept high and rapidly obtained.

Having these different analytical reports before the house is of great value in determining what may be reasonably expected from the boiler room. The time and expense put into these tests is very small when the ultimate results are taken into consideration.

The most important factor of the steam plant is the chief engineer in charge. The right man in charge makes a vast difference in the efficiency of the plant. Taking an average plant using about 100 tons of coal per week, when managed by a competent, progressive engineer, the economic efficiency may show a saving of $25 to $75 per week over one managed by a man who simly (?) claims to "know it all." It is a good investment to have a competent, well-paid engineer in charge. An engineer who has good, common education, who will study his business, read the power and engineering papers, not afraid to soil his hands, and not afraid to lose sleep, when required, to keep his plant in order, is likely to excel and protect his company's interests in manifold ways. This kind of a man will surround himself with wide-awake, hustling helpers who are in the business to succeed and desire to grow like the master-mind. The competent engineer will not tolerate wastes. He keeps his boilers, pumps, economizers, traps, and all piping in perfect working order. All piping and exposed surfaces are properly insulated. No leaks are allowed, neither will he waste hot water or steam. He knows the value of heat, and that waste of any degree increases discrepancies which in the aggregate will show big losses.

He is resourceful and does not lose his head when emergencies present themselves. He plans ahead and has schemes provided to keep the plant running in case this or that should give out. He has the cleverness of the young engineer, who, when being examined, was asked what would he do if he were on an ocean steamer and he discovered that the feed water did not enter the boilers? Said he:"I would examine the pumps." "Supposing the pump worked right and no water came—what then?" "I would inspect the piping." "If the pipes showed no defect, where else would you look for the trouble?" further asked the examiner. The young engineer, somewhat bewildered, replied: "I would look overboard to see if there was any water in the ocean."

The precautious engineer spends plenty of time in the boiler room to personally enforce a careful arrangement of the fires. He knows that poor firing means poor combustion, and a corresponding loss of money. The difference between good and poor firing may make a difference of 15 per cent. or more in the economy of the coal consumed. One hundred tons of coal consumed per week costs $3.00 per ton, represents $300.00 per week. (In most parts of New England this coal would cost much more). This makes power a costly item of expense to a manufacturing concern. In reality it is money in the form of coal that is being burned. If it were the money itself which was to be thrown under the boilers, how scrupulous all would be about the firing. Economy would become rampant! Especially if the firemen were advised that they could have whatever money that was not actually required to keep up steam!

One of the most important matters that the skilled engineer requires, is a rigid system of cleanliness. If the tubes are not scraped and blown out as often as necessary, much heat will be lost. The proper removal of clinker and ash and keeping draft flues in order, count upon the economical side. The same can be admitted of internal cleanliness. Deposits of mud or sediment, incrustation, scale, etc., add heavy losses to the plant.

Experience has proved that all air should be admitted

through the grate bars, and that a fairly thick, hot fire, with quick drafts, give best results. When heating surfaces are kept clean, drafts unimpeded and properly regulated, and the fires well proportioned; a steady, even combustion pressed; the coal can give its greatest heating qualities.

Intelligent firemen should be employed and reasonable assistance given them. A fireman engaged to help burn $300.00 worth of coal per week should have more attention than the average fireman ever receives. He works hard and requires plenty of sleep, and should be well fed. An over worked, half-starved, broken-down fireman is not the right man to give proper consideration for his company's coal bunks. His perception should be kept keen and interested in his work. The way firemen are changed in some mills would indicate that any kind of man can serve at this trade. If it is a good argument to say that it takes a smart man and hard work to do business and earn money, it is a poor argument to let a green hand burn it. Money saved in the boiler room is as valuable as that which is saved in the office buying.

Here we are reminded of the green fireman who was asked how many pounds of steam he carried in his three boilers. "Three hundred pounds," was the reply. "How do you make that out?" asked the superintendent. "Because each boiler carries 100 pounds pressure, and the three added together makes 300 pounds."

It is well worth while to keep training firemen for firing. Skilled help lessens the depreciation of the plant and gives it a higher efficiency.

Having the best help, good coal and a good, well-managed plant, a high evaporative efficiency can be secured from the coal pile.

Having given attention to the boiler department to ensure the highest reasonable efficiency, it is of the next importance to transmit the steam energy into motive power also with a high efficiency.

The steam engine, at its best, shows much greater loss than the best boilers—about 35 per cent. more. This means

that the efficiency of the boiler has advanced much faster than the improvements which have been made in the engine. The point can be illustrated further and better by stating that if one pound of coal contains 14,500 heat units, and if all of this heat could be utilized and transformed into power, it would produce about 5½ horse power for one hour. But under the most favorable advantages the best boilers can transmit only 75 per cent. of this power to the engine. And the best engine performances show that of this 75 per cent. received from the boiler, over 80 per cent. of this can be lost in converting it into power. This brings the combined efficiency of boiler and engine as low as 15 per cent. or less. If the business man measure this in just so many dollars, he will find that of—say—$300 worth of coal burned per week, he only gets about $45 of it into power to drive his plant after leaving the engine. And if this power plant is not up-to-date, or poorly managed, the combined efficiency may be as low as five per cent. or less, a money value of $15 or less.

Strange as this may seem to the casual reader, these are about the figures which the steam plant represents in practice. Hence it is important to remove our kid gloves in handling the power plant either in practice or in theory.

The steam engine is very simple in appearance, and is easy to manage by a skilled engineer. But to the incompetent man we must say "Hands off!" It takes a trained man to tame this monster machine and make it purr, and run so smoothly that a coin can be balanced on a cylinder-head for ten hours without being jarred off. As the efficiency of an engine is so low, it is of great importance to reduce every item of waste to its lowest terms. All parts must be so well adjusted that their combined movements may work together without friction. Friction is what takes power. All undue friction must be fought out of the way. As an engine must also carry the friction load of all the shafting in a mill before the machine can be given motion, care must be taken not to have undue friction. Recent tests in several mills show that the friction load of an engine and shafting in an ordinary mill varies from 20 to 40 per cent. of the net power.

The general average is about 25 per cent., but should not be over 20 per cent. All these losses combined showing the loss of efficiency at the boiler and engine, and the power consumed by the friction of shafting amount to about 88 per cent., leaving a net power of 12 per cent. to drive the machinery.

To avoid any possible misunderstandings or to avoid conveying wrong impressions to our students, we will illustrate furthermore what becomes of the fuel burned as follows:

	Per Cent.
Inefficiency of boilers	25
Inefficiency of engines	60
Total	85
Net power to drive shafting and machinery	15
	100

Deducting 20 per cent. from the net power for loss on account of friction, we have 12 per cent. left to run the machinery. Of course 20 per cent. of the net power equals only 3 per cent. of the total amount of fuel with which we started. The summary of the facts are now:

	Per Cent.
Lost efficiency in boiler and engine	85
Friction	3
Net power to drive machinery	12
Total	100

This shows that a pound of carbon, instead of producing 5.50 horse power, it can lose 85 per cent. and give us only about .825 of a horse power.

Proof: 5.50 less 25 per cent. loss at boilers equals 4.125 horse power. Deducting from this 80 per cent. loss at engines and we have left .825 or 15 per cent. of 5.50, equal to .825. Where the combined efficiency of both boilers and engines is so high as 15 per cent., it would take 1.51 pounds of coal to produce one horse power per hour. It must be borne in mind that this is at present a very high standard and rarely is, if ever, reached. But this is the top mark or

practically the 100 per cent. of the present age of steam engineering advancement, and there are three great reasons why even this low attainment is rarely reached in practice. First, the coal varies in quality and sometimes is far from the standard and may vary over 25 per cent. from the standard. Allowing that the coal is only 75 per cent. good then it would be good for 4.125 horse power, and holding the combined efficiency of the plant up to the standard of 15 per cent., it would take two pounds of coal to maintain one horse power per hour. But it is a fact that few plants are maintaining anything like this record. Competent engineers give this question a wide berth when asked as to how much coal is consumed per hour per indicated horse power. Some of them will say from 1.50 to 7 pounds. This brings us to the second reason for a low efficiency. The modern plant at its best is still far behind being able to utilize all the energy given to it. The third great reason is in the inefficiency of the attending force. Hence the average pounds of coal required is placed as much as 3½ pounds by one authority and another would say 4½ pounds, depending upon conditions.

But this record can be beaten by many plants, and even 1 3-10 pounds of coal per horse power has been heard of.

These figures are given merely to show the importance of fighting, in every good way, for a closer economy in our steam engineering plants. Above all do not overload the plant. This is not economy. Everything can give its best economy which has plenty of reserved energy. This is true and applies to every latent force or stored energy, whether in man, beast or machine.

* HOW TO GIVE SATISFACTORY PRODUCTION

Production is the magic word on which hangs the fate of most textile workers. It does not matter how good a person is, what excellent quality of goods made, how cheaply produced, if the production is not up to where it should be, after making all due allowances, there is "trouble in the camp," and some one must work it up or step out to let the other fellow try his hand. Men who are stalwart in strength, men who have bravely stood defeat in other lines, turn pale when told that the production is not up to the standard in quantity. The secret of it all lies in the fact that the men who turn pale do not know how to work up their production. To tide those people over, who are in trouble on this question, is the aim of the writer.

In the first place, when approached on the question of short production do not become excited. Be calm. Take your medicine bravely. Find out in the most agreeable manner just what is expected. Then, set about taking complete account of speeds of the different machines, and figure just what the possible production is. Go back several weeks to see what previous men secured for production under like conditions. Now make a list like this:

Production wanted.
Production at present.
Production possible.
Production previously obtained.

Also put down labor costs opposite each item. This comparison will reveal some very interesting problems. The production man will realize just where he stands in relation to the other three prpositions. He may also find that his present record is very much in his favor. The office men in their supreme ambition often over-rate the possible production, and this particular instance may prove to be no exception to this rule. He may find that his present production is

* Published in Fibre and Fabric.

nearly up to the mark, and much more than the other fellow was getting; also that the present cost is lower. Hence the discovery is made that more than one-half of the battle is fought on paper. But do not get hot-headed. Be calm again and all the time. Take these nice results to the man with the high collar, and have as pleasant conference with him as possible. Make him feel that you are as anxious to secure the high mark as he is, also seek his advice as to the best means to secure the coveted end; valuable aid may be given. This places some responsibility upon the higher power and relieves the strain considerably.

Another matter which should enter into consideration by all concerned is the solemn fact that if the production is down it cannot be worked up so fast as commonly supposed, especially if a new man or men are in charge, or the plant is a new one. It takes several months at the least to overcome old conditions and bring everything into complete sympathy with the new regime. Keep a steady pull, strengthen one weak place at a time; get men on each section that will pull steadily with you. Show them their weekly productions. Put them upon their honor and mettle. Keep every spindle operative, and every loom belt on the tight pulley. On Saturday afternoons have all the belts looked over and re-splice all that are liable to break before the following week. Keep ahead of time must be the everlasting watch-word of the hour. Foresee every contingency that is possible and have a remedy ready to cure the evils that might arise. When taken unawares by unforseen trouble be resourceful, making the best of every difficulty.

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* HOW TO MAINTAIN WEAVE ROOM PRODUCTION

A great deal has been written upon the effect of bad yarn on the production of a weave room, and we shall exclude that phase of the subject from this paper, assuming that the yarn,

* Published in Textile World-Record, September, 1905

warps and filling are all right, that the mill is running under average conditions, but that the production is considerably below par. Such a case requires close study. Good yarn and plenty of help are not all the requisites of success; there should be better management in the weaving department. In the office there is nothing that arouses suspicion sooner, nor is any deficiency felt more keenly than a drop in the production of the weave room. The cloth is the life of the plant. A shortage proves that something is wrong.

Every item of production on the cloth board should be looked over. A record should be kept so that not only the work of each hand, but the work of each loom can be traced. All looms showing a full percentage of production are crossed off the list, and for those showing a shortage a special record should be kept. See if these looms are up to speed. It frequently happens that a belt is slipping at the loom, or a counter belt may be slipping. Sometimes loss in production is caused by a pulley being slightly over or under size. Locate individual deficiencies in the hands. Sometimes a few poor weavers replaced or shown how to do their work will increase production quite materially. Good weavers sometimes get indifferent, with the result that the production is lowered. These need to be toned up. Loom fixers, too, play an important part in the production of a weave room. Indifference on their part may cause serious loss.

In checking up the production of a weave room it is best to put the responsibility into four groups: First, the product of each loom; second, the product of each weaver; third, the product of a section as cared for by a fixer; fourth, the supervisors in each weave room. In this way every person will feel a personal responsibility in the production. It is a good plan to post the names of the weavers that excel, giving their percentages and holding up their record as a model. Do the same thing in regard to the loom fixers and their sections. It places merit at a premium. Record breakers could also be substantially rewarded by an extra allowance per week. This is also an incentive to keep up

the record. Other elements which affect the production are the air, light, temperature and humidity.

SYSTEM AND SUCCESS

The work of a textile man is made up of a multitude of small things and intricacies. He is on the rapid firing line from morning until evening, and unless he has good marching qualities, a splendid bump of order, keen perception, and not afraid of hard work and is systematic, he may be left in the rear, never to rise above the most commonplace affairs, and finally be buried without having achieved success in its simplest degree.

The would-be progressive textile man, as in other lines of work, must be quick to grasp methods, adapt himself to varying conditions, and be thoroughly sytematic to make headway in the rush for supremacy against all ordinary barriers to success. The man with a system and containing the inherent qualities mentioned will outstrip and over-ride the non-methodical son of the cloth. The facts are legion where men have fallen before the bar of success because they were wanting in a sytematic way of performing their work.

In following up the application of the man with a system we find that he excels and is a much sought for man in responsible positions from the simplest to the highest. He is wanted because he does not become entangled in the meshes of his work and lose his head. He has a place for everything, and has a prompt, comprehensive method of execution. If he is making several grades of yarn or goods of any kind, he has a special place for each stock, placards the spot, marks the goods and precludes all possibility of getting sizes and qualities mixed. The seriousness of getting goods mixed cannot be over-estimated. It has cost many a responsible man a raise of salary, or a good position, and the management hard work to disentangle the mess, besides entailing large sums to be placed on the loss side of the company's ledger. Therefore, the object of this article is to bring before mill men in general the importance of the

systematic style of marking. This applies to every phase of a man's work.

The matter of taking orders is a serious matter, and yet how often it occurs that a man forgets details of an order and even forgets the entire order. Always make it a point to take the full weight of an order. Don't get the brain fag. Pencil your orders and their details on paper and keep them before you until the order is executed. The failure to do this has cost many a man a bright, prosperous future.

The system also applies to having a proper place for tools, having proper tools, and taking proper care of them. The man who uses his jack-knife for a screw-driver is not a man of the fibre. A fixer to be a good running mate with progress and profit should have good, appropriate tools. The man who has the right tools and knows just where he can lay hands on them when required is keeping pace with the big guns.

Another application of the system is in regard to the correct filing away of papers, letters, etc. It does not require a college education nor elaborate file cabinets to accomplish this end. Envelopes are cheap. Every progressive mill man from head doffer up, who cannot afford costly cabinets, should have a pack of large envelopes and mark one for each department, thus: Carding, spinning, weaving, dye-house, power department, general management, and so on. Whenever special bits of information on the above subjects present themselves to the eager student, let him cut them out of textile papers and file them under their proper heads. This system will prove of invaluable future service, as the writer can truly attest.

The man with a system, like the man with the hoe, is bound to dig up something and have a full dinner-pail.

Have a good system, for the textile plants have no use for the haphazard man.

*THE NEW OVERSEER—HOW TO TREAT HIM—WHAT HE SHOULD DO

The idea of this article is to bring more vividly before the mind of the reader the peculiar relationship of the new overseer to his help, to his employer, and to his new environments. What to expect, or what not to expect of him; how to deal with these new conditions; and how long should it take him to straighten his department, are questions which are of vital importance to all concerned, viz: his employer, the help, and to the new overseer. That his reign from the start should be in propitious is of equal importance to each party. A mistake at the beginning may retard progress to a remote season and possibly upset what might have been a prosperous reign.

In the nature of things it happens too often that too much is expected all at once of a new overseer. His success depends very much upon how he is received by the superintendent, and yet much depends upon how the new incumbent takes hold of the situation.

In the first place, the superintendent having found and selected the man of his choice, he should make the most of his opportunity to welcome him with strong interest. Make him feel that he is the man whose help he needs and wants. Keep in close touch with him and assist him in making his new settlement comfortable. Many a man makes a poor start because his settlement in the new house is not complete or comfortable. The new man needs time to settle down, and get some rest before undertaking a heavy position. Having settled and reported for duty, the superintendent should take the new overseer through his department and introduce him to the second-hands, giving all clearly to understand that he is to have entire charge and that they must refer their business solely to the new boss. The superintendent from this time on should respect this rule and never come between the new overseer and the help, and

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* Published in Fibre and Fabric.

see that the overseer has first consideration and receive all the orders first hand. The new overseer should never be burdened with the caution that he must show results at once or within certain limits. If the new overseer is the kind of man which should have been seelcted, it will not be necessary to strap a yoke on him. Just give him the reins; let him do the driving, and the results will come in due time.

What can and should be reasonably expected is that the new overseer will not attempt to revolutionize the place. The days of revolutionizing have passed. What is needed now is evolution in the textile business. The new overseer should build a fortress of security on what he finds. He should start with the work as he finds it and make it grow and bear fruit with him. It is poor policy to tear down the whole system he finds, and attempt to start a new regime all at once. Keep the plant running as it is found. Strengthen one weak place at a time. Keep a steady pull. Train the help that is found on the spot. Do not force your methods upon them—use the inductive method, which is to show them the better way by repeated efforts.

The new overseer, strictly speaking, should be an overseer who is always "new." He must be inventive, resourceful, buoyant, well read, a leading general at his business, and a man who inspires his help through thick and thin, and fires them with the zeal that carries weight into the production, finish into the quality, and profit into the sales. This is what counts.

How long it should take to bring all this about is the all-absorbing topic to the company. If the new man is a hustling, hard worker, and leaves the revolutionary methods behind, and takes a strong interest and a deep pride in his new sphere, it may take a long time to see the full result of his capacity; for his improvements never end. There may be no splurge nor colored soap bubbles to start with, but his record, in time, will make the profit side of the ledger teem with delightful interest to the management and the stockholders.

One of the most successful textile manufacturers has

straightened out some departments by increasing the cost of the department one-half at the start instead of decreasing it. But the company believed in him and trusted him—gave him every encouragement—and at the end of one year this man had so thoroughly straightened out the place, and organized his forces, that he increased the production more than 25 per cent. and reduced the cost 50 per cent. below what he found it. If this man's success had depended upon making a showing during the first six months of his reign he would have been pronounced a failure. It takes time to bring out results. Give the new man a fair chance, remembering that it may take a year to make a showing, and results are bound to follow. The second year will usually be a record breaker, and the older this man becomes the newer he is. All the help pull with him, and together they keep the orders promptly filled with much-sought-for goods. The new overseer should aim to fill his new place with these qualities, and then he need not worry about his future.

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*PECULIARITIES OF THE LOOM CRANK MOTION

The study of the ordinary loom crank motion and its movements is very interesting. There are few motions which perform so many different offices and give such a variety of speeds in one revolution as this motion does.

Many loom book writers give some explanations of the loom crank motion, but none of them give sufficient space in their valuable columns to explain the subject as fully and as clearly as is necessary to describe the whole business in a way that any student can trace out and understand, correctly, all there is to be learned about this motion.

We will follow the movement as it is made to revolve on the American make of looms, which means that as we stand in front of the loom, and the lay is home—against the cloth, or nearest to us—the first movement is for the crank to move upward, throw over, and return from the under-side. (Most

*Published in the American Textile Manufacturer

of the foreign loom makers revolve the cranks in the opposite direction).

In a single revolution of the crank, the shuttle passes through the shed, the pick is beaten up against the cloth, and to accomplish this the speed of the lay is quickened or accelerated so as to give a strong home run. Having done this the speed slackens gradually until a much slower speed is attained at the dwell of the lay, or turning point. This slow speed performs three offices: It permits the shuttle to pass along its course with less likelihood of being thrown off the lay, or left behind, as it were, because the reed is pulling away from the side of the shuttle. Incidentally, this saves the reed more than if the lay went in the opposite direction at this time and has a tendency to bear against the shuttle. The third office performed is that when the lay is back and going at its slowest speed, while the shed is opened, it serves to give the shuttle a freer and easier passage without injuring the warp threads. Having fulfilled these missions the speed is increased to give the homeward stroke that beats the last pick home in good shape.

With reference to the actual movement, it will be necessary for the reader to familiarize himself with the ordinary dimensions and layout of, say, a common cotton cloth loom, as follows:

The lay sword is about 2 feet 6 inches long; the crank depressed 3 inches from centre to centre; i. e., the crank centre will describe a 6 inch circle as it revolves or is turned over by its connection to the crank shaft. The bar or rod connecting the crank with the lay may be about 11 inches long. Now all this variation in speed of the lay is caused by the crank centre being on various looms, on an average, about 4 inches below the centre of the place or point where the crank connecting bar is strapped or fastened to the lay. If the crank shaft centre was on the same level with the place where the connecting rod or bar hooks onto the lay, there would be very little difference of speed between the outward and homeward journey of the lay movement.

A loom crank motion is different from that of a steam

engine crank motion. On the turn the crank runs or moves the connecting rod. While on the engine the connecting rod runs the crank and the balance wheel momentum carries it over the centres and the other irregularities, giving the machine a uniform speed. But an engine crank-shaft centre is always on a level with the piston centre, giving a uniform movement each way—inward and outward. In the loom, on account of the crank-shaft centre being below the level of the connection to the lay, the lay never runs at the same speed at any point going out or coming in, and the outward speed is different from the inward speed, the inward or return speed being the faster of the several speeds.

Referring to the illustrations, Fig. 1 shows how much of the circle is used in drawing the lay one-half way out. Fig. 2 shows how far the lay is drawn out when one-half of the circle is used.

Referring to Fig. 1, the circle shows the path of the crank in making a complete revolution. The solid lines outside of the circle show the positions of the lay when home—against the cloth and that of the connecting rod. The dotted lines show the positions of the lay when the crank is at three other points on the circle or path of the crank. There are two parallel lines, one solid and one dotted, running across the circle. The solid lines 1 and 2 (parallel to the dotted line B D) divides the circle exactly in the middle. The dotted line B D shows what part of the circle is used in working the lay outward and inward during the first quarter and the last quarter of its journey. When the crank has reached the point B on the circle the lay has traveled the first half of the distance on its outward journey. The solid lines within the circle divide the circle itno four segments which are simply to show at a glance the different portions of the circle over which the crank travels during each quarter of the lay's entire journey, and to show the relative speed of each quarter, as follows: Segment No. 1 corresponds to the path or journey of the lay from E to F; Segment No. 2 equals the journey of the lay from F to G; Segment No. 3 has to do with the return trip of the lay from G back to F, and Seg-

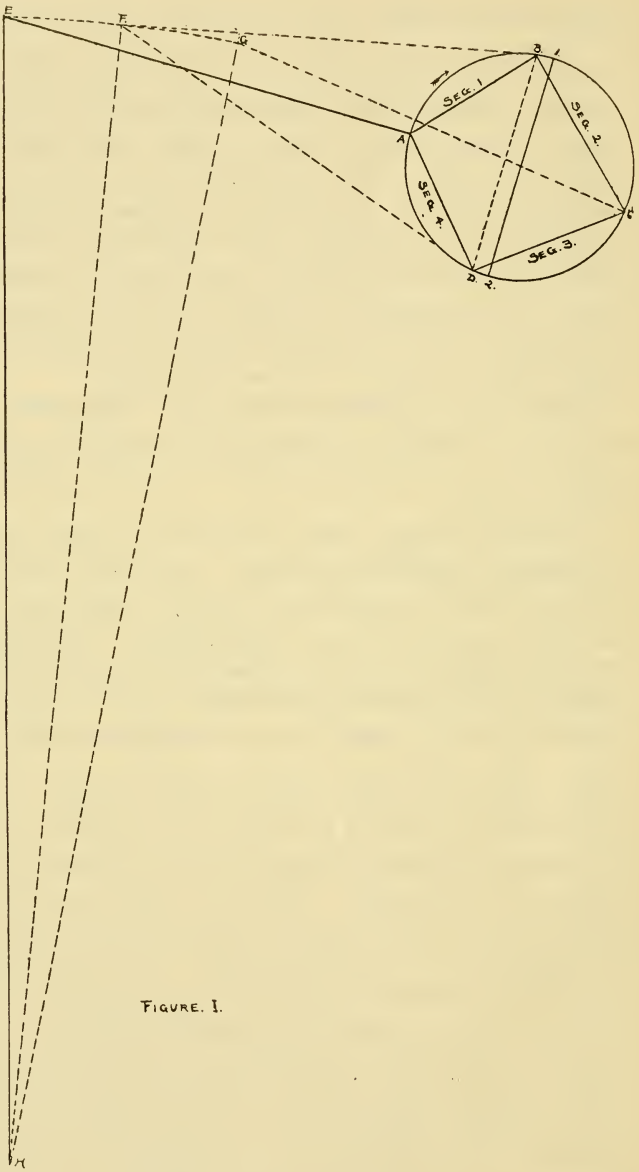

FIGURE. I.

ment No. 4 is used to bring the lay from F back to E again. Again, Segment No. 1 covers the paths of the crank from A to B, and the lay has traveled outward one-half way. When the crank leaves B and continues its journey on the circle to C, the lay has moved outward the last half of its journey outward. But it must be noticed that the distance from A to B is much less than is the distance from B to C. Segment No. 2 proves at a glance the relative difference. Now, as the crank travels at exactly the same given speed on this circle, it must follow that it travels from A to B in much less time than it travels from B to C. And it must also follow that the lay travels outward much faster on the first half of its outward journey, than it does on the second half of its outward journey. At C the lay has reached the point of slowest movement and the conditions are reversed. The lay returns at an increased speed, covering one-half of its journey homeward when the crank has reached D. Now it will be noticed that the line D to A is shorter than any of the other straight lines that enclose segments, and that it also encloses the smaller segments of the four. And yet while the crank moves on the circle from D to A, the shortest distance laid out, the lay has moved another quarter of its entire journey, or one-half way home, from the point F to E, which is one-half of the distance homeward from G to E. This shows conclusively that the last quarter of the lay's entire journey, outward and inward, moves much faster than at any other part of its journey. From F to E the lay is driven home rapidly to give that much desired beating up effect and bring the last pick well up against the cloth already woven. Here a new revolution of the crank begins and same operation is repeated as described.

Referring to Fig. 2, X is to show or mark the middle of the lay's path outward or inward. The whole is merely to illustrate further the points carried forward or argued in connection with Fig. 1. It will be noticed that the dotted line B-D divides the circle exactly in the middle. It will also be noticed that if the crank starts at D and across to B that the lay will have traveled from F to E back to F again, al-

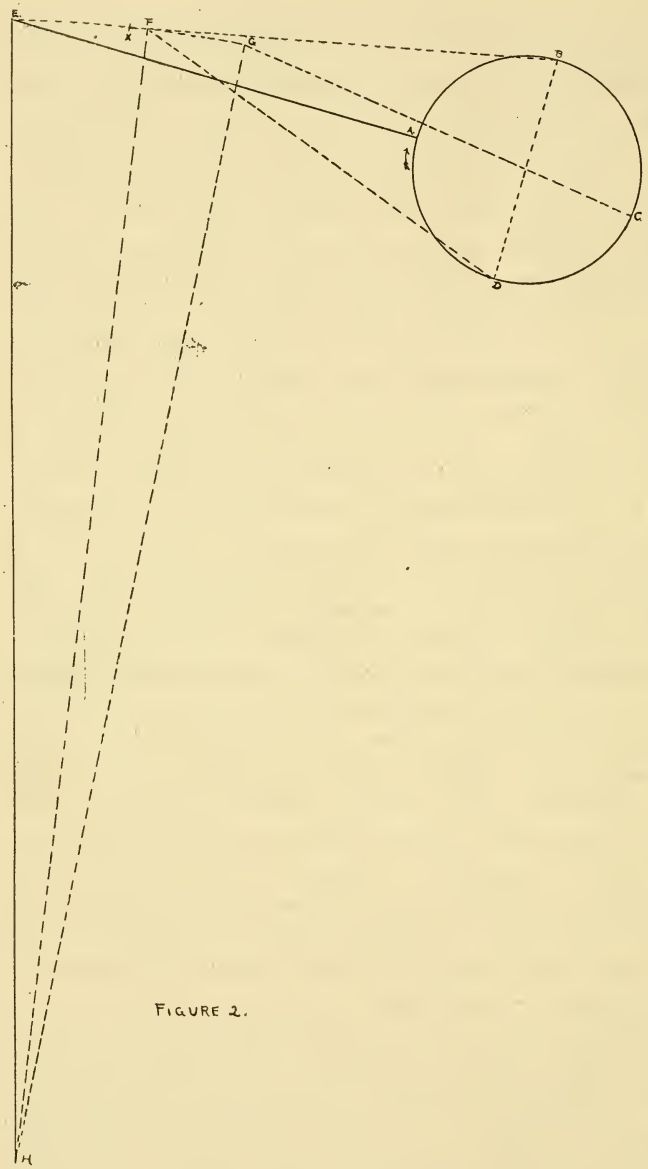

FIGURE 2.

most two-thirds of its entire journey. It will then be noticed that if the crank moves around the other or back half of the circle B C D, the lay has moved only slightly more than one-third of its entire journey outward and inward. As the crank travels at one steady speed, it must be understood that the lay travels much faster during two-thirds of its journey than it does during the balance of the movement.

There is another interesting point about this movement. It is that the lay moves farther outward than the diameter or throw of the crank. Why is this? One would naturally think that if the diameter of the circle were 6 inches, the path of the lay outward would be 6 inches also; but it is about one-fourth of an inch more than this. This is caused by the crank-shaft not having its centre upon the arc or circle that the lay describes. The tendency of the crank is to draw the lay towards its own (the crank's) centre of rotation. But the lay cannot be drawn out in a straight line. It must rotate outward on its pivot H, and as the path or circle which the lay describes, and must follow, does not bisect the crank-shaft centre, the circle and the lay are working slightly against each other, they move slightly in different directions; and as the distance increases by the angle over the straight line, the lay must meet the difference, and thus the lay gains some over the diameter or throw of the circle.

Still another point—the lay, at its home base, against the cloth, is at right angle to the cloth and strikes it squarely.

The whole arrangement and movement is one which has been scientifically planned and laid out with mathematical precision by loom makers. The dimensions and adjustments may vary, but this principle has been well retained by all loom builders as one of prime importance in the correct method of weaving cloth.

* WEAK PARTS OF LOOMS

There are many parts of the modern loom which are too weak and need to be improved.

The picker stick is of very short duration and a vast deal of expense to a weaving mill. Either the picker stick must be improved or some other method to fly the shuttle must be invented. It is believed that some inventors are now at work endeavoring to fly the shuttle with compressed air, to do away with the picker stick and all its needful kicking movements. It is also known that a very good loom has been perfected which operates without any shuttles whatever. The cloth is woven by needles, there being one needle on each side of the loom and each one reaching one-half way across the loom. In operation the needles pass the filling through the shed and meet in the middle of the shed. Either one or two picks can be passed through at one time. That is, the needles can pass the filling one-half way, one or two picks, and as they meet in the middle the pick or picks are exchanged or passed to the opposite needle and each in turn pulls them the other half of the shed. The only discrepancy about this loom is that the cloth made on the same has not full woven selvedges. This is caused by having only every other pick bind the selvedges. This might be further explained by stating that each pick binds the selvedge on one side only.

The writer saw this loom running in Boston some years ago at the rate of 500 picks per minute, and the people interested advised that it could run 1,000 picks per minute. It was making a good grade of plain grey cloth. The filling was supplied from a cone which could be of any convenient size. When only one pick was wanted, as in ordinary cloth, one needle only carried a thread one-half way through the shed to the opposite needle, which went in empty and only entered the shed to bring out the pick started by the other needle. In order to bind the selvedge on both sides the needles alternated in passing the filling.

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*Published in Fibre and Fabric.

Not Absolutely Needed

The above is mentioned simply to prove that the picker stick is not absolutely needed to produce cloth in a loom. Why this style of loom has never been adopted in some mills is not generally known. So far as the body of the cloth is concerned it makes the same as any plain loom, and no doubt the same loom could be adapted for making other lines of goods. Those who saw this loom less than a decade ago predicted a great and prosperous future for the same. The gentlemen behind the invention were very enthusiastic and also equally hopeful of a bright future for this loom. Still, no effort seemed to be made to immediately launch the loom upon the market. Constant inquiries were answered by stating that as soon as the loom was ready to market they would hear further. Years have passed and still no news has been given about this wonderful loom for publication. It is to be hoped that the inventors may renew their ambition to give to the weaving world a chance to prove the utility of their labors. A loom that can make a satisfactory cloth without the use of shuttles will bring about a vast economy in the management of a weaving plant. When the shuttle is done away with a whole catalogue of other weak parts on a loom is immediately dispensed with. The picker stick is done away with, along with the lug straps, leather pickers, picking shafts, cams and balls—all of which are short-lived and have to be replaced at frequent and almost regular intervals. That is, the average consumption of these loom supplies on each kind of looms, and on each kind of goods is about of the same average from year to year. Many experts have experimented in a variety of methods to either increase the life of each of these short-lived instruments, or, by inventing methods whereby these parts could be dispensed with.

Shuttle and Picker Stick

So far as the shuttle and picker stick are concerned there has been no marked degree of improvement that would increase the life of their usefulness. Many experiments have been tried with the picker stick, some of them as follows:

Binding the picker stick on the edge with iron; another way was of binding the stick completely with metal of various kinds, also with leather, wire duck, belt hooks, screws, but all of thes efforts have proved of no effect upon increasing the life of a picker stick. If anything is added to a picker stick with the view of strengthening it, it is a fact that it tends to shorten, and does shorten, its life. A picker stick lasts the longest when it carries no additional load to reinforce it. That is, the bare stick gives the longest service. This has ben proved by repeated tests covering an extensive period of time. An all-iron stick was even tried, and this did not work. Each time that a picker stick was either wholly or partly bound, the vibration of the stick would cause almost immediately the throwing off of the metal shackles piece-meal. A picker stick does not vibrate evenly from one end to the other. It vibrates fiercely at a point about two-thirds of the way down from the top. A good hickory picker stick should last eight months to a year, depending, of course, upon the style, weight and speed at which the goods are made. However, the average life of picker sticks, as they run, would average nearer six months than more.

Lug Straps

Lug straps have fared some better. The latest, best made, duck lug straps with cushion bumper, have increased the life service very much. Where the average life of lug straps was about six months, the improved goods which can now be obtained by reliable makers last a great deal longer, depending on the severity of the operations. There is a new leather picker which is so constructed that it gives the cushion type effect, so that when the leather picker strikes the shuttle it imparts a spring-like blow, and instead of the shuttle point wedging itself into the leather, this picker, which is oval-shaped, springs back and imparts and elastic blow which drives the shuttle to and from with less wear and tear. In other words the jar is killed.

There is still a great chance for improvement in the making of a more lasting rawhide picker for the multiple box and loom. These are costly goods and wear out too fast.

Picker Shaft

Picking shafts, or rocking shafts as some call them, as a rule, are made too weak to stand the strain. Loom makers should strengthen this weak place. And the repair shop should always replace broken ones with reinforced or stronger patterned ones.

Nowadays the picking cam has a detachable toe which is chilled. This gives the longest service. The picking rolls or balls are also chilled and receive the least amount of wear when properly chilled. Weavers should see that their goods in this line are properly treated.

The loom of today, even with all its improvements requires an endless amount of supplies, and is a very wasteful machine. There is no machine in use which works so hard to the square inch as does a loom. A loom needs to be well made, well put together, have the best of supplies, and receive the best of care by both fixers and weavers.

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* LOOM ORGANIZATION CHART

In the executive office of a large corporation, covering a large plant or an aggregation of mills in various parts of the land, or even distributed in this country and abroad as might be, it is necessary that the managing director or superintendent have all the information concerning all the looms in his mills conveniently arranged so that he can tell at a glance just what combinations he has for weaving any particular style of goods which his customers demand.

In a mill making only one kind of goods, such as common print cloths, and where all the looms are of the same width and style and on one kind of goods, the loom chart is very ample. In this case it only needs to show the number of looms in each mill, thus:

Mill No. 1	1,000 looms
Mill No. 2	1,500 looms
Mill No. 3	2,000 looms
Total	4,500 looms

* Published in Fibre and Fabric.

LOOM CHART

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Dept.	Total Looms by Makes.													By No. of Harnesses.					Lappet	Leno	Jacquard	By No. of Boxes.				By Different Speeds.				
	Crompton.					Whitin.		Northrop		Knowles.			Total Looms	Plain Looms.		Dobby Looms.														
																Wide		Narrow												
	36″	38″	40″	42″	44″	36″	40″	36″	38″	42″	44″	48″	All Widths	2	4	16	20	20			Single Lift	1	2	4	6	156	160	164	166	172
No. 1	1000	...	...	...	...	...	...	...	...	...	...	...	1000	500	500	...	...	...			...	..	500	500	500		500	500	..	500
	....	500	...	...	...	...	...	...	...	...	...	...	500	....	....	...	..	500			...	..	..	..	..		...	...	..	..
	....	...	500	...	...	...	...	...	...	.	...	...	500	....	....	...	...	...			500	..	...	500	..		500	....	..	..
	....	...	...	300	...	...	...	..	...	.	...	...	300	....	....	100	200	...			..	..	...	....	300	300	...	.	..	....
	....	...	...	...	100	...	...	..	...	..	...	...	100	....	....	...	100	...	..	..	.	..	..	100	.	100	...	.	..	..	....
	....	...	...	...	...	...	...	500	...	..	...	...	500	....	500	...	..	...	..	..	.	500	..	..	.	..	...	.	500	..	....
	....	...	...	...	...	...	...	.	100	.	...	...	100	100	....	...	..	...	..	..	.	100	....	..	.	50	...	.	100	..	....
	....	...	...	...	...	...	...	...	...	.	50	...	50	....	....	...	50	...	..	..	.	..	....	....	.	..	.	.	..	..	...
	....	...	...	...	...	...	...	...	...	.	...	50	50	....	....	...	50	...	...	.	.	...	....	....	50	..	50	...	.	..	....
Total in No 1 Dept.	1000	500	500	300	100	....	...	500	100		50	50	3100	600	1000	100	400	500	..	.	500	600	500	1150	850	450	1050	500	600	500
No. 2	....	...	...	...	...	...	...	..	.	500	...	...	500	....	....	500	. .	. .	500	.	.	.	.	..	..	500	..		500	..	500
	....	...	...	...	...	...	...	..		.	500	...	500	....	....		.	500		500					500	.	. .		..	.
Total in No 2 Dept.	..	...	.			...	.	...	. .	500	500	...	1000	....	...	500		500	500	500	..				1000			500	.	500
No. 3	1000	...	...	...	...	...	...		.		...	...	1000	1000	...	.	.				.	.	1000	....	. .	...	....		.	1000
No. 4	....	...	...	...	..	500		...	..	.	...	...	500	500	....	...	..						500	. . .		.	. .	..	..	500
	....	...	...	...	..	...	500	...	.	.	...	...	500	.. .	500	..	..						.	500	...	.	. .	...		500
Total in No 4 Dept	....	...	...	...	..	500	500	. .	..		.	...	1000	500	500	...			.	.	...		500	500	...	..	. .	....	.	1000
Pattern Room	....	...	...	...	50	..	...	...	..	.	...	...	50	....	...	.	45	..	10	10	5		.	.	50	50	...	..		..
Total in all Depts.	2000	500	500	300	150	500	500	500	100	500	550	50	6150	2100	1500	600	445	1000	510	510	505	600	2000	1650	1900	500	1050	1000	600	3000
Total by Groups.	3450					1000		600		1100			6150	3600		1045		1000	510	510	505	6150				6150 Average Speed 166 7				
																2045													
1	2					3		4		5			6	7		8		9	10	11	12	13				14				

REMARKS:— Looms on which 4 box work and up to 6 box work can be woven with 4 or more Harnesses 3550.
Looms on which 6 box work and on which are more than 4 Harnesses 1900.

As to how many are idle or hung up for repairs, these particulars would be shown by the daily reports from each mill and need have nothing to do with the chart.

A slightly more extended chart would be occasioned by having looms of different makes and widths in the different mills, but all to weave plain goods. Then the chart might assume the form shown below.

Make of Loom:	NORTHROP.				MASON		KILBURN & LINCOLN.			
Loom Widths:	36-in.	40-in.	42-in.	36-in.	40-in	42-in.	40-in.	44-in.	48-in.	Total
Mill No. 1.....	400	500	....	....	200	....	....	....	....	1100
Mill No. 2.....	....	....	....	1000	....	....	500	....	....	1500
Mill No. 3.....	....	....	....	....	1000	....	1000	....	....	2000
Totals....	400	500	....	1000	1200	....	1500	....	....	4600

This list gives the looms of each make and width, the total in each mill, also the totals in all mills of each width. All these looms having two harnesses and one box, it is unnecessary to waste paper, time and space to enter these items. Although there might be some difference in speeds, the carding list does not show this in all cases, as it might to advantage.

These simple illustrations lead up to some very complicated combinations, such as may be found in some large corporations, making a large variety of goods. And a conveniently arranged chart that shows all particulars at a glance offers many advantages over the loose bits of paper that are often mislaid when the information concerning some particular item is most wanted.

To this end, is shown on this page a chart which answers about every purpose that a hustling man deeds to have at hand where the conditions are widely distributed. We will take a supposed case, showing a plant of four mills and a pattern room. Altogether there are 6,150 looms, on which a large variety of goods can be woven. The mills have enjoyed a long term of prosperity. Starting from small beginnings they have added other styles of manufacture from time to time until their assortment covers much ground. They have small and large orders coming in all the time, all of which, as a rule, must be delivered within some specified time. The manager, to fill these orders, must know his

equipment thoroughly. He knows just how much of an order to accept and not get cancellations on account of being behindhand in shipping the goods wanted. He knows his business thoroughly in this respect, none the less, and greatly to his convenience if he has a loom chart before him which gives all particulars on one sheet.

Proceeding along this line it is the purpose of this article to illustrate such a chart and explain its merits. No claim is made for strict originality of this form. Neither is it necessary to have a set form for all mills. This particular list is one that has grown from time to time, as experience required, the writer having added some special features, such as the items of speeds, grouping totals and comprehensive headings.

Following the chart closely we find that there are 31 columns of details. For convenience, each column has its respective number at the top of the headline. At the bottom of each detail column will be found the general totals of looms of that particular detail. Below the base line of the detail columns are the special groupings which will be found very convenient at times. These are also numbered below the base line of the chart for the easy reference of the reader as we describe the outlines of the chart. The 31 detail columns are sub-divided into 14 groups, as numbered. Taking up the detail columns by numbers, Number 1 refers chiefly to the different departments. Columns 2 to 13 inclusive show all the looms of the different makes and in what department they are. In this group are shown four different makes of looms and how many of each width. Column number 14 is merely an assembly column for totaling all under one head at the bottom of each department and again at the bottom of all departments. Columns 15, 16, 17, 18 and 19 are to show how all these looms of different widths and makes are divided or distributed with reference to the number of harnesses they have, and therefore this group of columns is headed "By Number of Harnesses." This general heading is in turn sub-divided into two other groups—that of plain looms and dobby looms. And the dobby group is separated into two other parts to show the wide and the narrow

looms. All these groups play an important part in alloting the orders as they come in from the selling end of the business.

Columns numbers 20 and 21 tabulate the looms that have special fancy attachments or are rigged to receive them, or show that there are that number of attachments available if called for. Column number 22 covers the jacquard equipment.

Columns numbers 23, 24, 25 and 26 are to distinguish the looms by boxes, i. e., how many looms there are of 1, 2, 4 or 6 boxes.

The remaining columns, 27 to 31, have reference to speeds. Thus the general groups have been shown and explained.

At the bottom of the chart are the 14 groups, which are much the same as those already explained, with the exception that they are a little more sub-divided. Referring to them by number, number 1 is only a side heading. Number 2 group, of 3,450 looms, shows that there are that number of Crompton looms in the total equipment. No. 3 shows 1,000 Whitin looms. Number 4 shows 600 Northrup looms. No. 5 shows 1,100 Knowles looms. No. 6 shows totals of all makes. No. 7 shows 3,600 plain looms. No. 8 shows 1,045 wide dobby looms. No. 9 shows 1,000 narrow dobby looms. When combined Nos. 8 and 9 show 2,045 dobby looms. No. 10 shows 510 with lappet motions. No. 11 shows 510 with leno motions. No. 12 shows 505 jacquard looms. The proof columns, Nos. 13 and 14, show 6,150 looms. Column No. 14 very appropriately also shows the average speed to be 166.7 per loom.

Carrying our lesson further as to the utility of our chart, we will make some applications as to its usefulness. Here is an order for a small lot of wide fancy dobby work of 10 harness and 6 box work to be woven on 48-inch looms. Plenty of time is given for delivery of the goods. The manager refers to his chart and finds that he has 50 looms of 48-inch width in detail column number 13. Tracing this horizontally to detail column number 18, to see how many harnesses they have, he finds that they have 20 harnesses,

giving ample harnesses for the work. Tracing to the box group detail column number 26, he finds that they have 6 boxes, and in column 28 he finds their speed to be 160 picks per minute. He also finds that these looms are in No. 1 mill, where, as it happens, by the way, this special order will receive particular attention.

Example No. 2. A large order comes in for plain goods suitable for weaving on all narrow looms up to 40 inches. Owing to market conditions the price offered for these goods is low. This order would keep 5,000 looms going for some months. Referring to the chart again, we find all the looms we can up to 40 inches in width that are of fast speed and suitable for this order. Although these goods could be woven on any of the looms in the mill, the margin of profit is too small to put these goods on to wide looms, where the weavers are paid more per cut and where the speed is too slow for prompt deliveries. Reference to columns numbers 15 and 16 shows only 3,600 plain looms on which it would pay to put these goods—even if the wide looms had to stand idle. Now the manufacturing agent will not accept any more of that order than he can comfortably fill with his fast-speed looms. ,

On either lappet, leno or jacquard goods, he could only accept orders to the extent of about 500 looms each.

On narrow dobby goods, if price or margin of profit were sufficiently high to warrant the weaving of same on the 1,045 wide dobbies, as well as on his 1,000 narrow looms, he can accept orders in excess of what 1,000 looms would weave for time-delivered goods.

Another interesting aspect of this equipment is that the amount of work having 4 and up to 6 boxes with 4 or more harnesses, that could be run at one time, is limited to 3,550 looms. Of work having 6 boxes with 4 or more harnesses, the loomage is limited to 1,900 looms.

Lastly. There are always some men who are ready to call a halt at modern and rapid methods and who prefer to carry everything in their heads. While it is true that there are many men who are masterly bright in this way of manag-

ing, it is not a safe rule for the coming man to follow. It would be out of place, at least, to advise carrying so much detail in one's head. It might get clogged or the head-gearing become sluggish. If the head could be sent to the machine shop, taken apart, cleaned and oiled, like a watch, it might be safe to advise the simpler methods, as called. The modern scheme is to make the records do the memorizing and keep the brain fresh and new to direct with force and vigor. In these days of vast details it is swifter to learn where to find the figures on paper, than it is to commit to memory.

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* LOOM PRODUCTION CHART

Some weeks ago we published a loom chart to show at a glance the loom organization of the various mills under the same management. In this issue we present a production chart to show how compactly and simply the progressive production from week to week or month to month can be followed up at a glance, on each line of goods, in each mill, under the same corporate management.

Each line of goods being put through the mills has a specific possible production per loom per day, after having made all due allowances for necessary stoppages for broken ends in the warp and filing, and replenishing shuttles, also for cleaning looms and for repairs. It is customary to lay out or figure that if a loom ran constantly without ever stopping for any detail, it would produce 100 per cent.

Allowance is Made

As this is not possible under the present state of the art, an allowance is made according to the style of the goods woven. This varies from 10 to 20 per cent. or so, according as it is more or less difficult to weave. The officials determine about what this should be and then urge this standard to be obtained. And whatever is obtained in actual production is called the per cent. of the possible (100 per cent.)

* Published in Fibre and Fabric.

[2]LOOM PRODUCTION CHART

Average Yards Per Loom Per Day — 1908

By H. D. MARTIN

DEPARTMENTS	STYLE OF GOODS	Possible Yds. per Day	JANUARY 24 Days			[3]FEBRUARY 24 Days			MARCH 30 Days			[6]APRIL 16 Days		
			Looms Run	Yds. per Day	Average for 1907	Looms Run	Yds. per Day	Average for 2 Months	Looms Run	Yds. per Day	Average for 3 Months	Looms Run	Yds. per Day	Average for 4 Months
Mill No. 1	Dress Goods	38	500	36	37	500	36.5	36.2						
	Shirtings	32	500	31	31	500	31.5	31.2						
	Staples	42	1000	40	41	1000	41	40.5	2000	[5]35	37.6	2000	[6]42	39
	General Average	38.5	2000	36.7	37.5	2000	37.5	37.1	2000	35	36.2	2000	42	38
Mill No. 2	Prints	50	1000	48	47	1000	49	48.5	1000	49.5	49	1000	52	49.6
	Sheetings	40	1000	39	38	1000	39.5	39.2	1000	40	39.5	1000	42	40
	General Average	45	2000	43.5	42.5	2000	44.2	43.8	2000	45	44.1	2000	47	44.8
[7]Mill No. 3	Fancies #1	28	200	27	—	200	[4]20	23.5	200	27	24.5	Stopped No orders		
	" #2	30	200	28	—	200	29	28.5	800	29.5	29			
	" #3	32	200	30	—	200	31	30.5						
	Special #1	34	200	[1]31	—	200	32	31.5						
	" #2	36	200	[1]31	—	200	32	31.5						
	General Average	32	1000	29.4	—	1000	29	29.1	1000	29	29			
Mills Nos. 1 & 2	Grand Average	41.7	4000	40.1	40	4000	40.8	40.4	4000	40	40.1	4000	[6]44.5	41.3
Mills Nos. 1, 2 & 3	Grand Average	39.8	5000	37.9		5000	38.5	38.2	5000	38	38	—	—	—

NOTES

*The small figures refer to notes of the corresponding number below.

1. The Nos. 1 and 2 specials in No. 3 mill showed a low production. An investigation revealed the fact that a certain counter belt was slipping because this class of work was heavy weaving. This belt was tightened and the following month the production was higher.

3. February shows an increase of 3-10 of a yard, on the 5000 looms, over the January production. This is 1500 yards of cloth, and was well worth working for.

4. The low production at this point was caused by soft warps.

5. On account of being obliged to use the wide shirting looms for narrow work, they operated slower and reduced the yardage per loom.

6. April being a short time running period, the help endeavored to produce more goods which increased the yards per day, even over the standard or possible production laid out. Showing, too, that the office men are not unfair and do not overrate the possibilities.

7. This is a new mill and was not in operation during 1907.

8. Blank spaces are left to enter new weaves as they arise.

production. Going into figures, to make our matter perfectly clear to those who are unfamiliar with the method, suppose a line of goods has 60 picks per inch and the loom on which it must be woven operates at a speed of 180 picks per minute, a ten-hour day's production, if the loom ran continually, would be 50 yards, or 100 per cent. But as this line of goods is of somewhat difficult pattern to weave, an allowance of 20 per cent. is made, and therefore each loom is expected to weave at the least 80 per cent. of the possible production, which is 40 yards per day per loom in this case. Then 40 yards per day would be the standard production expected from the looms on this class of goods. Now if a loom production chart is laid out in blank form, with the expected production marked on the same for the different goods, and the blank spaces are properly filled out with the actual production per day as averaged, say, for each month, then, from month to month, a very interesting sheet of comparative production is kept before the house.

A Production Barometer

It acts as a production barometer, and the production hustlers having the record kept before them, will be more interested and endeavor to reach the forecasted production. It even occurs sometimes that the production men get more than the standard laid out by the head of this production weather bureau.

The loom production chart is so largely self-explanatory that complete detailed notes of the different columns seem unnecessary. Mills that do not follow up their production by this progressive and comparative method lose a very interesting chapter in their annals, and it is aimed to make the advantage of this loom production chart so clearly understood that any mill can take it up and test the method for themselves. Of course it can be seen that this chart only shows the average production under all conditions. If there are different conditions to contend with, such as broken time, or short time, looms of various styles, widths, speed, etc., it will be necessary to make additions or deductions to

ascertain the true reasons for apparently too great fluctation from the pace set by the standard key.

Yardage

It must be understood from the start that the yardage per loom is greater while a mill is on short time than on normal or full time. This is because help in general aim to make up the lost time in money, and another is that short time is less straining on the help, and they try to double their capacity during the short time period.

Again, plain, narrow looms can be more swiftly operated and produce more goods. Another matter that affects the production for the worse is when a line of patterned goods run more to the fancy side than to the plain side, or when the goods have more of certain colors, like turkey red, brown, etc., that weave not so well. There is another reason for lowering the average production at times, and that is when a large order for narrow goods overtasks the narrow looms and the warps have to be put into wider looms.

General Average Sufficient

Now if any or all of these different conditions were permanent, it would be very easy to sub-divide the production chart to follow up each special condition. But where the varying conditions are constant, it would require too much book-keeping to follow up each item by itself. In this case it is assumed that a general average is sufficient when accompanied with foot notes as to causes of slow production, and other matters.

For example, during a period or month of 24 days the production per loom is 40 yards per day under normal conditions. Now the following month of only 16 days, being a short-time period, might show 43 yards per loom per day under the same normal conditions as the previous month. The foot note should emphasize the fact that this is short time vitality. The next period of full time might show only 38 yards per loom per day. Tracing the index mark to the foot note, we find that the reduction of production might be or was caused by the narrow work overtasking the narrow

looms and getting into slower or wider looms; or it might be a case of the goods leaning too much to the fancy side; or too much toward a hard weaving color; or it might actually be a case of bad work; or even a streak of laziness.

In any event it is well to have the chart cover the reasons, by foot notes, for every abnormal fluctation.

This keeps every observer posted and satisfied as to the true reason or cause of changes, and the proper effort is then in order to remedy faults, if faults they are, as in the case of bad work or laziness on the part of the help.

When theses notes are not kept up, people are apt to forget the conditions prevailing at some former period, and misunderstandings are sure to arise which create much confusion and embarrassment with the men that are responsible for straightforward conditions.

To give color and illustration to these various statements the reader is referred to the chart, which is laid out for four months. But this arrangement can be carried on indefinitely for periods of one week, one month, or a year, at a time—whichever is best suited to local conditions. The idea is to have something that gives positive evidence of the conditions at a certain period, so that a man need not guess but know the facts in the case. Like the woman who had twins so nearly alike that she could not tell them apart. "How can you tell which is which?" said a caller. "O, that is easy enough," said the cheerful mother; "I puts me finger in Mike's mouth, and if he bites, he is Jim!"

Her evidence was conclusive. There was no guess work about it.

* HOW TO PREVENT FILLING WASTE

In all mills there is more or less waste made in connection with the filling proposition. This varies in proportion to the amount of care that is given toward building the cop or quill; in distributing it around the looms; and in the handling of same at the looms by the weavers. At this particular time, when managers are straining every effort to reduce wastes and bad work to a minimum in order to turn the largest per cent. of the new material into perfect, marketable goods, any advice which leads to a closer economy in this line is eagerly sought by those who have charge of the mills.

As textile establishments, in their various processes, wind and unwind millions of bobbins daily, and as the success of such plants depends largely upon properly built bobbins, it is of great importance to have them well wound. The cotton may be of the best grade and the quality of the yarn first-class, but if it is not properly wound on the bobbins, waste and poor work are sure to follow.

Well built bobbins are the pride of up-to-date managers. When the help notice them (and they are sure to do so) it appeals to them and makes them better attendants to their work. Bad bobbins go hand in hand with poor help and bad work, and demoralizes the mill.

In most mills plenty of time is given to looking after the good work itself, and they have elaborate systems by which they can tell any day how much they are manufacturing, how much there is on hand, and where it is. But in regard to the bad work and the waste it entails, not all mills have as good a system as is available to determine the exact status of the percentage of loss that is carted away from their plants from this cause alone. As a rule they can tell you exactly what is the total percentage of loss; but as to exactly where and why it is made, and who are making it in the mills, few could give as intelligent an account as it seems reasonable to expect from those in charge.

What is needed, then, is more attention given to this

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matter, and a proper system established that can make it more interesting to follow up each day. Everybody hates a badly built filling bobbin or quill. From the superintendent down, nobody has any use for it, and through mistaken economy the matter of badly built cops or quills is often left to take care of itself. And it is a fact that in some mills, where very little poorly wound filling is sent to the weaving departments, it is left "kicking around" for days and sometimes a week at a time, and when the aggregation is seen, here and there, the impression is conveyed that a vast deal of bad work is made while in reality little of it is being made. In a case like this it is too bad to give the workers a bad name, while making splendid work.

The writer has in mind a mill which turned off nearly 30,000 pounds of filling in varied styles and numbers per week, and made proportionately a very small amount of badly wound bobbins and quills. And yet what was made was allowed to accumulate for about six weeks in the weaving departments. At this time the overseer of weaving thought it would be a good plan to become ugly, and so he called the manager's attention to the several piles of bad work, and sort of gave him the impression that things were radically wrong, and that it was impossible to reach a higher percentage of production with such bad work as that. The managers gave the spinners a "call down," and there was any amount of bad feeling caused by what might have been entirely averted if the true state of things had been known, and which would have been known had proper attention been given to the business.

Of course, it was very imprudent on the part of the weaver to take unfair advantage of the situation to make fuel for disturbance. Here is a reverse case—in a mill where a lot of waste was being made, but where it was so carefully cleared out every day, the impression was conveyed that the mill was almost free from bad work so far as the casual observer was concerned, as he passed through the mill.

Now, there is a remedy for all these troubles. It requires careful attention, a good system and hard work. But once

the system is established, the task becomes pleasant and interesting. Here is the remedy: A responsible person should be put to the task of receiving, daily, every questionable filling cop, bobbin or quill, assort the heap, count each group, tabulate them, and detail each lot to its proper section for a thorough search into the real cause of their being made, and to have every fair means used to prevent a repetition of the evil.

The man should be a trustworthy person who can be relied upon to see to it that the bad work is collected from the various sources, and also be able to impartially assort it and distribute same intelligently and make out his reports so interestingly that he can insist upon getting better results without paralyzing the personnel of the plant.

There is nothing frightful about straightening out a pile of bad bobbins, if it is undertaken properly.

The daily tally must be kept up and at the end of the week the total should be averaged per day. The same should be done for the monthly and the quarterly returns.

This system has been so well established in some mills that the entire constituency seemed to be falling over one another to reduce the bad results and bury all out of sight.

The reports were as eagerly sought on this matter as were the reports of cases of goods shipped. And on 30,000 pounds of filling the badly wound bobbins were reduced from 17 per day to 5½ bobbins daily.

The yarn numbers ranged from 6s to 36s.

Another important matter in connection therewith, is to so systematize the whole, that bad work can be traced straightway to the persons who made it. There is nothing like being able to trace it right up to its source to reduce the evil and replace it with good results.

In a system like this no bad work is allowed to accumulate in the weave room, and the filling stock is kept clean and runable. It is also found that many bad bobbins, which are laid aside by the weavers, are runable, and if picked up daily they are prevented from getting shop-worn and so dirty that it becomes necessary to waste them. And again, such bob-

bins, if not gathered daily, actually become snarled and go into the waste house after all.

This is worth looking after, and those who have the system established gain vastly thereby. If it pays to have a good system of looking after finished goods, on which there is a small profit, then, surely, it must also pay to have a good system to look after goods on which not only the small margin of profit is wiped out, but which goods themselves are wasted and sold at possibly one-third the cost of raw material, plus the cost of manufacturing up to the process in the mill where the goods are wasted. In the next breath the bright mind grasps the broad conclusion that waste carries with it primarily a triple loss: 1st, loss of profit on the goods not sold that might have been made from it; secondly, the price of same as raw material is practically wiped out; thirdly, the cost of manufacturing it into waste. And with this triple expansive loss, there comes also other losses, such as loss production, second-rate goods, etc., caused by the bad filling interfering with the regular routine.

Watch this. Fight it, and get the goods.

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*CARE OF CHAIN QUILLERS

Gradually the chain quilling machine has grown into use in connton mills, especially in mills making colored cottons, until this department is an important one in the make-up of cotton mill management. Some large plants have from 50 to 100 of these machines, and as no papers have appeared with reference to giving these machines proper care, the textile readers may appreciate some advice on this subject.

The chain quiller has long ago passed the experimental stage, and is now a well understood success, where proper care is given to its simple requirements. The spindles, as the spindles of all other machines, require to be kept clean and properly oiled. If they are allowed to become clogged in the bolsters with dirt and thick oil a great deal of power

*Published in Fibre and Fabric.

is lost besides causing many tardy spindles. What is meant here of tardy spindles is a spindle which refuses to wind or fails to carry its load, thus making the process of running a chain to completion too slow and intermittent and increases cost per pound.

Another point to consider, is that the speed being, of necessity, much greater than the bobbin speed, care must be given not to drive the spindles faster than is necessary to carry on the winding process securely at the bobbin's smallest diameter—or at least winding capacity, which, of course, is at the empty barrel of the bobbin. If the spindles are driven too fast, needless power is consumed by the excess friction not needed to carry the bobbin while loading. The felt washers should be kept renewed often enough to be uniform.

Chain quillers, like other machines, should be taken down and scoured often, and all parts adjusted with the idea of giving as perfectly filled bobbins of yarn as possible. The bands should be of uniform size, kept clean and of equal tension. The thread guides should be renewed whenever they become grooved by the continuous passing through of the ends or threads.

The matter of production varies with the size and style of work. As a rule, these machines, everything else being equal, will run well and give splendid results, when kept in proper order. A good way to do is to keep a record of each machine's production and finally averaging the production per spindle at the close of each week for the department. It is also a good plan to keep a record of when the spindles are oiled and machines are scoured.

All these things tend to give a higher production at the most reasonable cost.

* PROMOTIONS

Next to the word "success," there is no word in any language that means so much to a human being as the word "promotion," or its equivalent. In the business world particularly, promotion is the magic word which hangs over every young man's head. Every young man who is ambitious wants to rise in some good way or other and longs to be promoted.

But how many are ready to be promoted? That is the question. Are you ready?

The word "ready" is also as important as the word promotion, and every young man who has this magic word hanging over him should also make certain that the word "ready" is placed alongside of the word "promotion." These two terms must be identical and labelled side by side on the man. In fact, of the two words, the word ready is fully as important. The Roman soldier always had a motto on the shield he carried, and that motto was: "Always ready." Now the man who wishes to win promotion must be "always ready." This advice does not imply that it is only suited to the man young in years, but all men who feel young and are capable of doing still better in the future.

What does it mean to be ready for promotion? Why should any one happen to be not ready for promotion? This is just what we are going to talk about. It is because of this delusive idea that everybody is always ready for promotion that so many never reach this happy stage. A man must make sure that he is ready before taking it for granted that he is fit for promotion. What must he do? There is no secret about this. Any man can possess this requisite. There are a few things to be considered.

First and Great Requisite

First of all, be promptly on hand at your work in the morning. Don't be afraid to get there ahead of time, and never be late. This is the first and great requisite. Any man can do this to start.

* Published in Fibre and Fabric.

Having reached your work, the next step is to put all your time into your job. Do not watch the clock. Get off more work than is expected of you if you possibly can. Grow so fast in these qualities that it will be noticed that the position is too small for you.

Larger, But Not Above His Position

The man must be larger than his position, but he must be mighty careful not to feel above his position. Make your position the apple of your eye and cling to it as though the whole world would grasp it from you if it could. Never throw up a small job expecting a larger one unless it is definitely promised. Many a man has done this to his bitter sorrow. And to some, this drop has downed them for all time. Hang on until some good manager invites you to rise to a better place.

Another Important Consideration

Now, besides all that has been said there is another important factor to be considered with relation to this subject. That is the matter of being posted on your business outside of your immediate department. The man who thinks his department is the only one worth living for has already reached his "finish." He is also on dangerous ground if he thinks he is the only man that can run his department. He must seize every opportunity to learn more about his business from others—outside—in other mills, and study well what relationship his department bears to the previous departments and to the subsequent departments. The man who does this and endeavors to fill that relationship with proper bearing to the other departments falls into great favor with his company and the help in general. If this man is promoted, as is apt to be the case, when an opening occurs, all the help in the mill will readily follow him because they feel that the ship is safe in his hands.

Not a Hap-hazard Event

It is readily seen that promotion is not a hap-hazard event. It is, instead, the development of a well-balanced and

organized effort. And a general supervisor would be hardly worthy of his place if he did not recognize this merit in his men when he has opportunities to promote men. Of course it is not always necessary to promote them in his own mills. It is, nevertheless, a credit to him to help them secure promotion in other corporations when it is mutually understood that a man would appreciate the advancement. It is unpardonable to hold a deserving man back.

Ahead of the Game

Now as to the application of these principles. Here is a fixer who became a good one by studying his machines while he operated them. He put in some of his spare time and learned to fix. He did not go whining around for every little break that occurred. He learned to do some of these odd jobs himself. He could change gears, etc., before the promotion came to him. This man becomes a second-hand, and then overseer, because he kept ahead of the game all the time. He always did his full share and more. He kept himself posted in advance about his trade. Perhaps you who read this article are an overseer, and you would like to become a superintendent. Suppose a treasurer sent for you to be interviewed as a prospective candidate for a superintendent's position. How would you answer his questions intelligently if you had not given much thought and study outside of your own department? What if he should ask: At what speed would you run your combers? How many yards per day should a 40-inch loom get off on a certain line of goods? What would you say? Are you posted?—that is the question. These questions do not amount to much in themselves alone, but quick and intelligent answers to a few well asked questions may give the treasurer the clue to the inner man, and lead him to give you the job.

Of course many men are engaged on their previous reputation, who, if asked some pointed questions, might answer wide of the mark. Even Patrick was a mighty good fireman, although he could not give, in engineering words, a good description of what steam is. Said he, when asked as to

what is steam? "Steam is cold water gone crazy with the heat!" Not a bad answer after all.

The ready-to-be promoted man is also a man who is level-headed. He does not get rattled. He cultivates the art of using good judgment. He studies well all the points at issue and does not get cornered. He keeps his forces well organized and drives the business in a manner that brings the largest measure of success wherever he is placed. He is the promoted man of worth. Would you like to be promoted? Be ready and in line. Next!

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*VARIOUS COTTON MILL QUESTIONS

Intelligent answers given by the ordinary mill man to common questions connected with the trade from day to day give that man an advantage over his less informed competitors. The man who is naturally interested in his business keeps posted, and the way that he answers these common questions, when he is approached, is the index to his ambition, and shows how high his mark of interest can be placed. There is always a certain amount of information that any man can obtain, without placing himself in an embarrassing position or interfering with another man's business, if he goes at it right. It is rarely the case that the honest seeker of information is turned down if he poses as a student and is not trying to meddle by putting on a semi-official appearance, forcing himself upon the arena of the learned man's playgrounds, and there demanding recognition as an important faction. And so the man who desires to expand by feeding his ambition here and there must recognize the difference between these two distinctions in securing what he wants.

An Illustration

To illustrate. Here is a man who perhaps is an overseer. He wants to be a superintendent some day. He is doing his best to make a good record in his department, and is a strong

*Published in Fibre and Fabric

co-worker, doing his best to promote good feeling and the welfare of his company at every point. He may be a spinner, and he does all he can to deliver his goods in the most wearable condition that it is possible. Now this spinner goes to the weaver and says: "Some day, Mr. ——— you and I want to superintend a mill. Can we learn what is necessary, and exchange some notes? If you will give me some points that I ought to know about weaving, I will reciprocate and respond to your questions regarding spinning, or perhaps you know all about spinning already." This man is likely to be received with open heart and make friends that he will be proud to meet in the future, and they will be equally as proud to meet him.

The Opposite

Here's the opposite: He may be an overseer or bookkeeper, and is going to rise at all hazards, regardless of his turn or not. He is going to "go up," hit or miss, and walk all over his brethren of the fibre. Watch this man. He is now going to visit another department. (In fact he is rarely on duty anywhere else). He puts on an officious air, picks up a bobbin, examines the yarn, approaches the overseer of that department, and makes his pronunciamento. It may be after this fashion: "What number is this yarn?" This question is answered.

"Look out and not to get it mixed. I will take this bobbin with me to test it," says the young chap.

Here the overseer draws the line, and says: "No you don't—when you want anything from this department, you bring an order for it, signed by the general superintendent, and then you can have it. Until then, I call this game off."

Then the pronunciamento-man shows his displeasure by stating that the general superintendent is perfectly willing that he should have access to everything. He gives the overseer the impression that he stands in so well with the "boss" that the boss would do anything for him, and that as soon as he can keep the bobbins picked off from the floor in good shape, the boss will turn off the best overseer he has to give him the job.

Turned Clock Hands of Progress

This kind of a wisdom-seeker, by his undiplomatic approaches, has turned the clock hands of his progress far away from the noon-time of his success. He is very much like the camel with the great hump on his back. He will move slowly and be kept for a curiosity as long as it is possible to do so. And his prominence as a leading general of his industry will be scarce. So scarce will he be, as such, that he will be actually forgotten, and prominent men of the trade will say of him as did the farmer of the camel he saw. This farmer was at the circus for the first time, and when he saw the camel, he stood before it spellbound for fully twenty minutes. Then he turned about in disgust and confidently said to himself: "There ain't no such animal!"

The textile industry in any of its branches calls for a wide range of information in the man who desires to be up and doing things. This is because the industry covers a wide range of subjects, and the coming man is called upon to air his views and talk sensibly on many or all of them.

Sample Questions

Such a simple question as the following may come up:

How many bales of cotton can a good weigher weigh per hour?

Those who are posted know that a good weigher, under convenient arrangements, can weigh 60 to 80 bales per hour. A man who averaged 600 bales per day of ten hours would be doing extra well. In this case the weigher does not handle the bales himself. The bales are merely supplied to him as fast as he can weigh.

Or a question like the following may arise:

On staple colored work, what would be considered a good average loom production?

Answer: 80 per cent. to 82 per cent. would be a good average.

On such goods, what would be considered a good, low average of seconds?

Answer: Three to four per cent. On plain white work

seconds should not exceed two per cent. Some leading mills on choice fine combed goods are getting along very well with only 1½ per cent. of seconds, which is a good showing.

What per cent. of variation is permissible in the weight of these fine goods when finished?

Answer: Not over one per cent.

How about the yarns which enter these goods, such as 60s, 70s, 80s and up to 120s?

Answer: Not over two per cent. from the standard number wanted. That is, No. 90s yarn might vary about two numbers too light to two numbers too heavy, or about 4 per cent., all told, between extremes. Some mills can do better, but we are stating average conditions.

How about coarser and uncombed work?

Answer: All other work should not vary over 3 per cent. from the standard. That is, taking No. 10s yarn, it should not vary more than about one-third of a number too light to one-third of a number too heavy.,

What per cent. of waste is considered allowable in a medium goods mill?

Answer: The waste account should not exceed 16 per cent. of the net weight of cotton put through the mill.

Important and Useful

These sample technical questions are all very interesting ones, as well as thousands of others in the trade, which could be asked and answered by some well-informed men. And yet, how many men who desire to become more valuable to their principles are trying to post themselves on these important questions? How many men are there who could tell what the price is today of a pound of the cotton they are handling? All these questions in general enter into the make-up of the very useful rising mill man. So important are they considered that, it is said, parties are now at work getting out a volume of 1,000 important textile questions asked and answered. This will be for the benefit of many men who desire to get into closer touch with the catechism of the business.

Studying the business thus leads to the absorption of information which is the forerunner of knowledge. Knowledge is power, and power will drive everything right if you get enough of the right kind. Get all you can of it, and step forward, please!

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*THE VALUE OF AN EXECUTIVE TO HIS CORPORATION

The true value of an executive to his company depends, after all else that can be said in his favor, upon what he knows which he can have applied to their business, to make it progressively successful.

For a mill to be fairly successful at present, it does not mean that it can be or will be successful next season, or next year, on the same basis of operations as in the past. Like the regiment on the field of battle, the captain is obliged to study the tactics; he must manuever, and he must keep moving out against the enemy and keep charging and recharging against same. But to remain in one place, or on one basis may be fatal.

If the machinery builders ceased to improve the machines; if the skilled manufacturers ceased to improve the process, and the efficiency of the help; if the commercial end of the business did not continually give sharper competition, then the basis of operations could remain the same. The happy medium would soon be learned by the mill managers, and adjusted, the annual clock of the business would be wound, and everybody would simply wait for the clock to need rewinding.

But the

Successful Textile Business

is not staking its success on this go-easy manner. It takes men of brains to conduct the business, and men of brains have the foresight; and they are long-headed enough to keep pace with the ever changing conditions of competition, which must be met by improving the machinery, improving the

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process and methods of handling, increasing the efficiency of the help, and also keeping abreast of the times at the commercial end of the trade.

Among those who are inexperienced along these lines, there are always those who think that all that is necessary to run a mill right is to get the job of governing same. "Give me the agency," says a young man, "and I will straighten the place out." Another says: "Give me the authority and I will show you what can be done;" and still another man with one hand already on the gold pot, as it were, sings out: " Give me the salary—never mind the title of the position, nor the authority, and I'll make the thing go." But the fact is they are all on the wrong trail, and have left out the

Most Important Requisite

of all. While positions along with the authority that measures up to it, and the salary which is likewise commensurate, are good things, and go a long way toward assisting a man in making a success of his charge, there is something behind all these other things which is much more needed to bring about their materialization. First, a man must know how to do the business.

Second, he must know that he knows how. There is a difference here that must not be overlooked. To say the same thing in other words: First, knowledge of the business is essential. Secondly, confidence in himself that he can carry out that knowledge with practice, and there we must follow our subject a step further. The man who knows that he has the knowledge of his business well in head as well as in hand, must know another virtue, and practice the art to a finish. This is to surround himself with men who recognize that he knows his business, and those that are willing to follow him and see him through the

Thick of Fight

men who will follow the master mind, whether he is in town or out of town—those who will pick up a bobbin from the floor even if they find it or see it on the floor after dark, and

even if no human eyes could witness the deal. This is the truest value of a man to his company. This man is worth more than any salary that any company can afford to pay him.

This art is no secret art. Many men do not realize what they can accomplish until they have confidence in themselves. To "know thyself" is acknowledged by scientists to be a great study. Take account of stock often, and strengthen your assets. Remember that what you know about your business is your greatest strength, and your most valuable capital. It is said that if a horse only knew its strength it would receive more considerate attention from the hand of man. And it is much the same way with the man. The man of

Internal Strength

the man who can put his ideas and knowledge into practice by those who are helping him in his mills, is constantly adding some good to the place, and accumulating strength, and that man, because he knows his strength, cannot be held down, and gets what he wants. Reverse this condition and tell us of what use is a man's ability, if he does not know that he has it? There is, however, one consolation. If he does not know of his ability, he will be quite contented to remain at the bottom of the ladder. While the man who has no ability, but thinks he has,

Is Never Satisfied

anywhere. He creates confusion and unrest, which unsettles matters to a large extent.

But the man who can organize, systematize, and line up his internal forces that are well backed up by his great knowledge of the business, and who can set these internal forces at work externally through the hands of several thousands of co-workers, that man is a genius, a powerful general manager upon whom no constituency or board of directors would dare to estimate his complete value to them, and they realize that they could not pay him fully what he is worth. On the other hand, this genial manager cheer-

fully takes what they can afford to pay. He gets far less than he is worth to them, but he is the most satisfied wage earner there is in the plant, even if he does carry heavier responsibilities, and works harder to the square inch per dollar earned, than anybody else does.

Therefore, if you know something, be it much or little, set that something to work for you. Know that you know how, and then you are safe and all right. Open the front door and walk in; there is plenty of room on top. But if you don't know how and do not want to know, stay where you are, for there is also plenty of room at the bottom.

There is a vast deal to our subject, and the following quotation is the philosophy of the whole story boiled down: , "Men are four. He who knows not, and knows not he knows not—he is a fool; shun him. He who knows not, and knows he knows not—he is simple; teach him. He who knows, and knows not he knows—he is asleep; wake him. He who knows, and knows he knows—he is wise; follow him."

*USEFUL MILL PROBLEMS WORKED OUT

As a whole there is no business that requires so many different problems to be solved as the textile trade. It does not matter how long a man has served one or more branches of the trade, nor how much experience he has had, new problems come up every little while, and the man of the moment must be a man who can grapple with them and either restore or bring about the proper measure to keep things going smoothly.

Some of these problems are old ones to the older and more experienced men, but are new to the new man. Some are simple, while others are more intricate; but all of them need careful study with reference to the application of the principle to a certain place that may be, at times, out of line of generalities. What is meant by this is that it is one thing to perform an example at school, but quite another thing at

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times to apply the same rule to a machine. It makes a difference how the machine is geared. Take the matter of draft, for example, on a spinning frame. It may be geared so that in one case you follow the rule, while in another case it is necessary to reverse the rule. It is a matter of knowing the work, the machine, the conditions wanted, and then it is a matter of good judgment to so figure that those conditions wanted are brought about, no matter if new or unheard of rules must be followed, or even a new arithmetic established.

The textile man must win out even if he has to hunt the whole creation for a new rule or system to work by. While the learned professor can figure well, in school, on generalities, he cannot do much figuring about a spinning machine until he learns how to spin or to adjust the machine. The poor mill man can run the machine, but often has to learn to figure. So when you average up both men, they are at a certain equal par on this subject. The easiest way to learn some of these problems is to have the trick shown us by someone who knows how to do it.

In this article it is proposed to bring to light some of the unusual problems which arise from time to time in the course of a progressive man's experience. On what is termed straight work, as in a plain goods mill, making print cloths or sheetings, it is rarely the case that such difficult problems come up, as do in connection with mills that are on custom novelties and forever changing from one style of goods to another, and which frequently create combinations that are not called for on straight work.

To those who have not had a varied experience there are many knotty problems which may in time be encountered, and it is well to be prepared to meet them. To know how to card, spin and weave, either individually or collectively, is desirable beyond question. To know how to do one or more of these, as a trade, is of prime importance. That a close student and a hard worker can learn a branch well, either by serving his time and studying in the mill, or by taking a textile school course and then serving his time in the mill, is unquestionable. There must be study and serving of time

at the work itself in either case. To be a hard worker simply is not sufficient. A person must study as he works and be able to think and reason out his knotty problems when he meets them. This is important, because in large plain goods mills, as well as in the textile school, abnormal conditions do not arise.

When a man starts out to take a new job that may have a variety of goods connected with it, he may find himself surrounded by local conditions entirely foreign to him. Therefore he must be versatile, as it were, to be able to cope with different local conditions, to make any line of work that he may have been accustomed to manufacture.

Carrying out this subject, here is a case in hand which comes in for treatment:

Problems

1. A man took a yarn mill and was required to fill an order for 8s yarn. It was a small order and had to be made at once, or considerable loss of future trade would be the result. He had plenty of three-hank roving, with which he made 18s to 24s, and a little two-hank, from which he made 12s to 16s. There was not enough two-hank to make the 8s and no gears to use in case there was enough two-hank. He was a rapid thinker and decided to make this 8s from the three-hank and the two-hank run double. He filled his order on schedule time and secured much future trade consequent upon the excellent quality of this yarn.

2. Now the question arises among those who have never had occasion to resort to this makeshift as to what hank roving this combination gave. If he had used three-hank double, of course the simple matter of dividing 3 by 2 would give 1.50, which is right. But where the double process is made up of two different sizes of roving, the rule is to multiply one by the other and divide by their sum, thus: 3x2 divided by 3 plus 2 equals 1.20 hank.

3. If a spinner has a draft of three between the middle and back rolls and a draft of four between the front and the middle rolls, what is the total draft? Ask ten ordinary

spinners this question and nine of them will answer that the total draft is seven, which is wrong. The rule is to multiply one by the other, thus: 3x4 equals 12, which gives the correct draft.

4. A yarn mill had a call for a small lot of 12.3 yarn. As this was from a regular customer, they did not wish to turn the order down, although it was very inconvenient to arrange changes to make it just at that time. In their stock they had an equal amount of 16-4, and the manager showed his tact by securing the acceptance of this odd lot on hand in lieu of the 12-3 wanted, which was no difference in size.

5. It was necessary to change a spinning frame from fine to coarse work, and for a twist gear it required a 60 T gear, which, by the way, was the same size as the jack gear. This was a "hurry up" order, and no twist gear could be found. The spinner had to juggle with new conditions again, and finally decided to run this frame without a twist gear. He simply moved his 60 T jack over where the twist gear belonged and used it as an intermediate between the cylinder gear and the train of large gears, and secured the twist wanted without delaying.

6. How to make long staple yarn that has a core of short cotton or a waste centre. Make it from triple roving process instead of the double roving process. Have three small roving trumpets instead of one for each end. Pass the long staple roving through the outer trumpets and the waste or inferior roving intended for the core should pass through the centre trumpet. The core roving should be made a size smaller than the binder rovings. This will make a very nice appearing yarn, but the strength will be below par.

7. How to find the throw of the heart: Measure the distance from the centre to the toe and deduct the distance from the centre to the heel. The remainder gives the throw.

8. How to ascertain the amount of weight on the top rolls of spinning frames, etc., where the leverage system is used: Weigh the weight; we will suppose that the weight weighs four pounds; the length of the lever from where the

weight hook hangs to the point where it passes through the stirrup is five inches, and from this point to the lever screw, one inch. The rule is to multiply the long lever by the weight hung to same and divide by the short lever, and then add the weight. Example: 5 inches times 4 pounds, divided by 1 inch, plus 4 pounds equals 24 pounds.

9. Percentage: To many the lessons of percentage are yet unknown. It is surprising the number of men who already occupy positions of more or less responsibility and who do not understand how to compute percentage. To illustrate this assertion: Some years ago it was necessary to increase the speed of some machinery slightly, part of which was driven by pulleys of 20 inches diameter and the rest by pulleys of 30 inches diameter, but running at the same speed. The superintendent ordered the 20-inch pulleys to be replaced with 24-inch pulleys and the 30-inch pulleys to have 36-inch pulleys instead. The overseer, who, by the way, was considered a good manager and a successful man, found a great deal of fault because this edict called for four-inch larger pulleys in the one case and six-inch larger ones in the second case. And it was only after the most careful analysis that this man was convinced that each group of machinery was being speeded up in the same proportion. "Why is it," said he, "that you are increasing the speed more on the larger pulleys than on the smaller ones? You should increase the size four inches on both the 24 and 36-inch pulleys." It is because of these simple confusions that the writer is led to explain how to solve some of these hard (?) problems. The same question arises about changing one tooth of twist or draft when a 20 T gear is working on one set of machinery, but changing two teeth of twist or draft on another set of machines making the same goods as the other set, but using 40 T gears. To settle this important question the whole matter is one of percentage or relative differences. The rule is to bear in mind that the constant number of percentage is 100. In other words, this constant number, 100, represents the whole of anything that is or can be divided into 100 equal parts. Let us now take up the case

of the pulleys: If a 20-inch pulley is increased four inches, it is increasing the size one-fifth, as one-fifth of 100 is 20; the size is enlarged 20 per cent. That is, the size is increased at the rate of 20 inches in every 100 inches. Now, in regard to the 30-inch pulley, we must find one-fifth of same, which is six inches, and six inches is 20 percent. of 30 inches, and it is increased in the same proportion that the 24-inch pulleys were, and both will give the same increased speed. In regard to the gears 20 T and 40 T, if we add one tooth to the smaller gear we must add two teeth to the larger gear, because it is twice as large; one-twentieth of 100 is five; two-fortieths of 100 is five. Both changes equal five per cent,. and one is not increased more proportionately than the other.

10. How to change the draft or twist "one-half tooth:" When a crown gear or jack gear is twice as large (or nearly so) as its accompanying change, draft or twist gear, changing one tooth in either the crown or jack gear gives only one-half the result that changing one tooth in the regular change gear does. This measure is often very useful in properly adjusting twist and sizes when close figuring is desired.

11. Testing the yarn strength tester: In a mill where a very good quality of yarn was being made, the breaking strength was very poor. "What makes our yarn break so poorly?" cried the management. The testing machine was tested and properly adjusted and the yarn was found to be of excellent breaking strength. Under the writer's supervision a second evil of this kind came to light. The yarn was breaking much better than its quality would warrant. An inspection of the yarn tester revealed the fact that the weight had been moved up on the lever arm about one-quarter of an inch, giving much less train on the weak yarn and making it appear to be stronger than the standard. This machine should be tested, and the way to test it is to hang a 100-pound weight on the hook. If the pointer registers 100 pounds on the dial, the tester is in proper order. See that the machine stands plumb.

12. How to approximate the strength of cotton yarns

instantly: Divide 1,800 by the number of the yarn and the quotient will be nearly what it should break in pounds.

13. How to ascertain the centrifugal force: Square the velocity in feet per second; multiply this by the weight of the revolving body in pounds. Then divide this product by 32 times the radius in feet at centre of gravity. The centre of gravity means at exactly the middle of the body when evenly balanced. If unevenly balanced or the body should be irregular, the centre of gravtiy would not necessarily be in the middle of the body, but at a point where the weight of the body should be evenly distributed on all sides.

14. To find the length of belting in a roll: Add the whole to the diameter of the roll; multiply this sum by the coils in the roll, and 13 per cent. of this product will give very near the length in feet.

15. If a spinner is using a filling bobbin, the diameter of which is 7-16 inches, with a $1\frac{3}{8}$-inch ring, does he gain anything by substituting a bobbin of $\frac{5}{8}$-inch diameter and $1\frac{1}{2}$ inch ring, and how much is the difference? He is a gainer by the change. The difference can be found in this way: The difference between 7-16-inch bobbins and $1\frac{3}{8}$-inch rings is 15-16 inch. The difference between $\frac{5}{8}$-inch bobbins and $1\frac{1}{2}$-inch rings is 14-16 of an inch, and 14-16 of an inch being 1-16 of an inch less than 15-16 of an inch, the spinner has the advantage of having 1-32 of an inch less distance from the bobbin barrel to the ring than before the change. An improvement of this kind always makes the work run much better.

16. When the diameter of the bobbin is increased is more twist being put in the yarn, and how to ascertain the difference? More twist is put into the yarn as the bobbin increases in size. The proper rule or method for ascertaining the per cent. gain of twist per inch when the diameter of the bobbin is increased is illustrated as follows: We will take the two different size bobbins mentioned in problem No. 1, one being 7-16 of an inch diameter and the other $\frac{5}{8}$ of an inch. We will assume that the revolutions per minute of the front roll is 128, also one inch in diameter, and that the

speed of the spindles on which the bobbins are used is 9,000 revolutions per minute. Then proceed as follows: Multiply the speed of the front roll together with the diameter of the bobbins, thus:

128 × 3 1-7—402 in. of yarn are delivered per minute:

7-16 in. × 3 1-7 = 1.375 in.
⅝ in. × 3 1-7 = 1.964 in. } Length around Bobbin.

The next in order to learn is the number of rings or layers of yarn that each can take in winding the 402 inches of yarn delivered by the front roll. Example:

Bobbins.
7-16 in. 402 in. ÷ 1.375 in. = 292 layers.
⅝ in. 402 in. ÷ 1.964 in. = 205 layers.

Each layer represents a loss of one turn of twist and must be subtracted from the total revolutions per minute of the spindles.

Bobbins.
7-16 in. 9000 — 292 = 8708
⅝ in. 9000 — 205 = 8795

Now, by dividing each remainder by 402, the relative amount of twist put in by each bobbin is ascertained.

Bobbins.
7-16 in. 8708 ÷ 402 = 21.66 turns per in.
⅝ in. 8795 ÷ 402 = 21.88 turns per in.

To find the per cent. of twist gained subtract the lesser turns per inch from the greater turns per inch, and then divide by the greater, thus:

21.88 — 21.66 = .22 × 21.88 = 1 6-100 per cent.

Of course this example only shows the amount of twist put into the yarn when starting the spinning frame with the empty bobbins. Thereafter the twist is constanly varying by the increased size of the bobbin, as it is being filled; the

rising and falling of the traverse rail, the different degrees of the tension, sizes of bands, variation in numbers and finally by the unevenness of the yarn itself at any number, and the action of the weather on the bands and upon the work in general. But as the "give" and "take" of these different forces cross one another's pathway so frequently, these differences are considerably neutralized and a piece of yarn, as a rule, when twisted under normal conditions, is quite evenly twisted. Another matter which helps to neutralize the varying forces mentioned and which we believe has never been mentioned by other writers, is the fact that the twist runs and adjusts itself to a large extent as it is laid onto the yarn.

17. That troublesome jack gear question! It often occurs that when the jack gear has to be changed on a twister or spinning frame that the beginner is troubled about just how to proceed, especially when the jack gear is not adjustable to the cylinder gear, but is in a fixed swivel to rotate about the cylinder gear. In this case if a larger jack gear is required, it is necessary to reduce the size of the cylinder gear in the same proportion that the jack gear is enlarged, and vice versa. The simplest rule is to add the total number of teeth in each gear, thus:

Jack gear	80 T
Cylinder gear	40 T
Total	120

From this sum subtract the number of teeth in the new jack gear of the same pitch and the remainder will be the number of teeth which the new cylinder gear must be to pair. Example:

Total teeth in old pair	120 T
New jack gear	100 T
New cylinder gear	20 T

That is, any pair of gears of the original pitch, having

a total of 120 teeth, can work properly in that fixed or limited space. The distance from centre to centre of both combinations would be the same. In making this change, if it is impossible to find a new pair of gears of the same pitch, the distance from centre to centre of the original pair having ben ascertained, any pair of new gears of a different pitch having the corresponding distance from centre to centre can work in the same space. Of course, where the jack gear is adjustable to the cylinder gear, either can be increased or decreased in size, independently of the other.

18. Another technical point in connection with the jack gear question is its relationship to the twist gear. If a jack gear has 80 T and the twist gear has 20 T, what twist gear should pair with a jack gear having 100 T? The rule is one of simple proportion, thus: 80:100::20:25. The mental solution would be: As 20 is one-quarter of 80, so 25 is one-quarter of 100.

19. As already intimated in a previous problem, percentage is an important problem in a mill, and it is well to be ready with this end of the business at all times. Here is an easy one: What is the relationship of 10 and 20 or the whole and one-half of anything? There are three things about this proposition: First, 10 is 50 per cent. of 20; second, 20 is 200 per cent. of 10; third, 10 is 100 per cent of 10 (or of itself) less than 20. In other words, it depends upon which quantity is the whole or 100 per cent. at the start. First, one-half equals 50 per cent. of the whole; second, the whole is 200 per cent. of the half; third, one-half is 100 per cent. of one-half (or of itself) less than the whole. The first is found by adding two ciphers to 10 (or to the one-half) and dividing by 20 (or the whole). The second is found by adding two ciphers to 20 (or the whole) and dividing by 10 (or the one-half). The third is found by adding two ciphers to10 and dividing by 10 (or by itself).

20. In a mill the relation of one quantity or production to another is often quite puzzling to the young man. Here is a little more complicated problem. A superintendent brought an overseer some yarn and said: "You can get 10

pounds of cloth from this yarn and 5 per cent. waste." How much waste was made, and how much yarn was there altogether? As there is to be 5 per cent. waste besides the cloth, the 10 pounds of yarn represents 95 per cent. of the whole, and 5 per cent. of waste the remainder; total, 100 per cent. The operation is one of simple proportion, thus: 95:100::10:10.526 pounds, total yarn, and 5 per cent. of this equals .527 pounds of waste.

21. "But," says our student, "I cannot do proportion. What is the rule?" Here is a rule which, once learned, is of everlasting convenience. In simple proportion we always have three terms with which to start and the fourth term is the one we want to get at. Of the terms we have, use the following simple rule: Write for the third term that number which is of the same kind as the required fourth term. Of the other two numbers, write the larger for the second term, when the answer should exceed the third term; but write the less for the second term when the answer should be less than the third term. Multiply the second and third terms together, and divide their product by the first term. But even this rule needs some illustrating to make it clearer or better understood. Taking our superintendent's example again. We have 95 per cent. or 10 pounds of the yarn and want 100 per cent., and we known that 10 pounds equals 95 per cent. of the whole. Then we say 95 per cent. is to 100 per cent. as 10 pounds it to what? We want more of the yarn and so we make our third term the 10 pounds, and as the answer should be more, we will make our second term the larger and the first term the smaller, thus:

First term.		Second term		Third term.		Fourth term wanted.
95	:	100	::	10	:	?

Multiplying 100 by 10 gives 1,000, and dividing by 95 gives 10.526 pounds.

22. Here is a more intricate example: How many kinds of shrinkages in money values has say, 1,000 pounds of waste which should have been made into cloth while being handled in the mill? There are three distinct losses in connection

with this waste. First, a loss of profit on the goods not sold which might have been made from this waste; second, a loss by selling this waste at only a fraction of the cost of the same when it was purchased in the raw stock; third, a loss caused by the expense incurred in carrying same through the processes up to the point where the waste was made and thrown out. The example illustrated by dollars and cents is as follows:

1,000 lbs. of raw stock cost at 12c. per lb..	$120.00
Loss of profit on same on goods not made from this, at 2c. per lb.....	20.00
Cost of carrying same through several processes averaged, at 2c. per lb.....	20.00
Total.....	$160.00
Deducting amount received for waste sold at 2c per lb.....	20.00
We have left a total loss of.....	$140.00

This represents what would not have been lost if this waste had been made into goods and sold.

To illustrate further and better, this example, we will put it into concrete form. We will take that same 1,000 pounds of stock and suppose that 500 pounds of it is made and dropped out at the picker room, and that 300 pounds goes through the picker room and through the carding department, and is there dropped out. Of the balance, 100 pounds goes through all the processes up to and is dropped out in the spinning department; but the last 100 pounds goes all through the mill up to the weaving and finishing, and yet comes out waste instead of cloth. Now the first 500 pounds may cost, say ¼c per pound in passing through the picker room, the next 300 pounds cost ¼c per pound for going through the picker room and 1c per pound for going through the carding room; making a total on this lot of 1¼c per pound. The next 100 pounds does not drop out until passing through the spinning; thus the cost of spinning, 1¼c, or whatever it may be, must be added to the previus cost of 1¼c for passing through picker and

carding departments, making a total of 2.5c per pound. The balance of the lot, 100 pounds, having gone through all the mill, we must add to the previous 2½ cents the cost of weaving and finishing, which being, say 10c, we have a total of 12.5c per pound on this lot. And the total average is 2c per pound for the 1,000 pound lot.

The example, in concrete form, is as follows:

Loss in going through the mill.

Waste.	Picker @ ¼c	Carding @ 1c	Spinning @ 1¼c	Weaving and Finishing @ 10c	Total.
500 lbs.	$1.25	....	....	....	$1.25
300 lbs.	.75	3.00	....	....	3.75
100 lbs.	.25	1.00	1.25	....	2.50
100 lbs.	.25	1.00	1.25	10.00	12.50
1000 lbs.	$2.50	$5.00	$2.50	$10.00	$20.00

$20.00 divided by 1000 lbs. equals 2c per lb.

This shows the importance of keeping the waste as low as possible, for our problem proves conclusively that there is a threefold loss carried with every pound of waste that goes through the mill. The whole idea should be to produce the saleable goods from all the waste that is possible and wipe out the threefold loss by making a reasonable profit, which in this case amounts to only 2c per pound, or $20 on 1,000 pounds; but that is better than losing $120 on it, besides the $20 which could have been gain if made into cloth.

And so the problems come up, one after another, and unless a man has tact and is more or less familiar with odd and out of the way methods of accomplishing quick results, he will be out-generaled and lose prestige. The cotton manufacturing business is now on a plane where it requires men who can grapple with new problems, and meet them and solve them with the every day things at hand.

*SPINDLE BANDS

Some New Figures

So much valuable information has been written about spindle banding that it would hardly seem possible to record anything new in connection therewith. Be that as it may, here is more information on this subject which may interest the reader.

It is generally the case that more bands break on a damp day or during a moist period than during normal weather. Just what per cent. more bands break during damp or wet weather is a matter which the writer desired to ascertain. To accomplish this a record of the bands put onto cotton spinning frame spindles was kept for several weeks, and the condition of the weather was also observed and recorded. The number of spindles under this test was 7672, and the average number of the yarn 16. The duration of the test was 41½ days of 10 hours each, or a total of 415 hours. Of this time 175 hours were damp weather and 240 clear and normal weather, making 73 per cent. damp weather.

During the damp weather 1743 new bands were put on and during the normal weather 2267 new bands were put on. Making an average of 102.53 new bands per day or 9.96 per hour. While the average for the normal period was 94.45 per day or 9.44 per hour. This proved that slightly over 5 per cent. more new bands are renewed during damp weather than during normal weather.

Another noticeable variation noted in connection with this test was the increased renewals on Mondays or during the first ten hours of each week. The average for this period reached 113.30 per day, or 11.33 per hour, while the average covering all the remaining time was 96 per day or 9.6 per hour, an increase of 15¼ per cent. more renewals durthe first ten hours of each week than during all the remaining time of the week.

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*THE TEXTILE DESIGNER AND ECONOMY

The textile designer holds an important position in a textile plant. He is the mill management's great assistant, and his position is as delicate as it is intricate. He is the cloth constructing medium between the selling house and the mill. If the selling house controls the mill, he must abide by its commands. If the mill is an independent faction, then the designer caters to the mill.

The Controlling Faction

In either case what is meant is that the designer follows the advice of the controlling faction. In both cases the suggestions come through the office and are there passed upon by the local management, and then referred to the designer. Of course, if the selling house controls the mill, their advice must be followed as closely as possible and the mill protects its local interests as fairly as it can without rupturing the selling end. Any radical changes must be referred to them and appealed thereto upon their merits, while, if the mills control the selling house, or sell direct, the difficulties of the designer are settled by the local agent. In any event, the latter arrangement has many advantages, if the plant has a ready market and not obliged to cater to any special faction. However, if the selling house controls and is in a position to dictate, the mill should be favored, as far as possible, and the local agent's advice should go far toward molding the advantages of the mill into the goods.

Best Adapted to the Mill

In other words, the goods should be of the kind that are best adapted to the mill. Many a mill has been hampered and ruined by saddling it with lines of goods that were utterly unadapted to the machinery organization. At all hazard, any agent has every right to rebel against any attempt to saddle a plant with a line of goods which the mill cannot manufacture at a reasonably expected profit. No

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person is more fitted to judge than the agent is, of the proper goods to be made in his mills. He controls the local plant, together with the superintendents and designers, and has every facility to learn and determine just what can be profitably manufactured in his mills.

First Duty to the Corporation

Taking it for granted that a line of goods is determined upon as being a suitable line to be made, it is now within the province of the designer to work out his salvation by being dutiful to his corporation and confine his designs within the limits of the governing policy. And it is along this line that this argument is to follow. That is: the specific duty of a designer toward his company after knowing what is wanted through his superintendent.

Before proceeding technically, it may be well to remark or explain that the reasons for entering upon this discussion are many. Firstly, designers, especially young designers, are sometimes over-ambitious to show their skill in producing much fancy work and drive the work more to the fancy side than is necessary, and yet not seem to technically exceed the company's limit.

Attractive Goods

Secondly, the selling house wants as attractive goods as possible in the line secured, and if it is not financially interested in the mill, it may care very little about the mill limitations connected therewith. Its business is to sell goods, and the more it sells the more commission it gets. But if the mill makes no profit on the goods manufactured, and does not sell direct, the commission profits do not add a copper to its prosperity. In fact, the more of these goods that are sold the poorer the mill becomes. There is a third reason for a strong tendency toward making goods more fancy than required. It is the desire to please the markets, but at a point where, although the goods are much sought for because of their attractiveness, the people are not willing to pay the price at which it is profitable to make them.

Feeding His Ambition

Now it must be understood, at the outset, that a good, faithful designer must not feed his ambition at the expense of the company. If he wants to study along higher lines than his present employer's field offers, let him rig up a private room at his home, buy his own yarns, practice on his own time, pay his own bills and count the cost. If he is compelled to foster his ambition thus, the chances are that he will become very much more interested along the lines of his firm's business and confine himself to their simple demands.

Valuable Hints

Next he must seek to become very popular with the local management by behaving according to their wants and let the selling end take care of itself; unless he is working directly under the selling end's orders, as is sometimes the case. He must not, also, lose his head with the notion that he can, by side-tracking his firm, tickle the market with his creations and become famous at a few bounds. The way for him to become as famous as he deserves is to work solely for the interest of his company with all his might. Trying to rise against their interest is unjust and deserves contempt. If he is paid to originate and create anything within his scope, very well, then we make our best bow to him and hope that he will create some new attraction to captivate the market for his company. But if he is paid to reproduce certain samples or to reproduce them within certain allowances, depending upon his ability or good judgment, he must remember that his duty is to follow the line closely and not give or take too much. And his duty is to never let a sample piece of goods leave the pattern room without showing it to the superintendent and tabulating every detail for his comprehensive scope. If there are any outs about the goods that might arise at any point, should orders be received for the line, the designer and superintendent should foresee this. The designer should keep no secrets from the superintendent; but lay everything bare before him; then, if the superintendent decides to submit the goods, there can be no misunderstanding in connection therewith.

Keeping Close to Basic Structure

Having decided upon submitting a certain line or class of goods, it is of great importance to confine the make-up of the different styles and patterns close to the basic structure or original outline as laid down by the management. What is meant by this is the basic layout. For example, the width of the goods is one standard which is maintained throughout the line. Then follow the length, number of the filling yarn, number of the warp yarn, number of ends in the warp, and finally the picks per inch of the filling and the number of the reed. This permanent standard of organization gives a unit of weight and general character which identifies it as a certain line of goods; and which may be known by a given name such as the Pride of the Age, or something of that nature. The kind of stock, too, must be kept to the line. That is, if carded or combed work, short or long staple, etc., the kind of stock selected must be adhered to—it will not do to mix stocks of different kinds and mince matters. A uniform selvedge is, of course, imperative.

Next, the things that will vary considerably will be the colorings; number of shuttles; number of harnesses, and finally the almost limitless assortment of patterns that will be harmonious to this particular structure, some of which may be woven on either plain or dobby head looms and still retaining their individuality as a line. However, while there may be allowed considerable range of colorings, number of shuttles, and number of harnesses, it is well to confine the line to as few multiples of these as possible. For example, it may be well to limit this particular line to not exceed five shuttles and not to exceed six harnesses. It would be folly to have perhaps one-half dozen patterns out of a hundred with six shuttles and eight to ten harnesses, and all the rest mostly four shuttle and six harness work. The idea in limiting the line to certain specifications is to give the different processes from the yarn to the cloth, more continuity, and to give the goods a more even pace and price for manufacturing. It is also easier to get at the cost and to

figure on a satisfactory sale price. Another great advantage is to be able to know, for certain, what looms it can be confined to in passing through. The same applies to a considerable extent to all previous processes throughout the mill and back to the warpers.

Colors

In regard to colors a great deal of wisdom can be displayed in their selection. It is not desirable to have too much similarity in colors from one shade to another. Again, as white or bleached soils easily, it is well to have as little ground work of this predominating as possible. Another trouble which has to be taken into account is that if some colors are introduced which take much more time to dye than others, there may be some delay on the styles having this particular color. In the cheaper line of goods, it is well, too, not to offer samples which contain colors that will cost too much to dye in proportion to the grade of goods or price that will be received for them.

Cords

The matter of cords is of no small moment. Care must be taken not to give away too much stock in cords, either in striped or checked patterns. It often occurs that the line will pass with merely corded effects. That is, the lines or stripes are brought out by manipulating the colors in a way that gives every appearance of having heavy cords, but no cords are used at all.

The Pattern Room

Lastly, we have to devote space to the method of getting the work through the pattern room in the most economical manner. Having as few colors as possible will preclude the necessity of tying up a great deal of yarn; giving a freer and less congested circulation of yarns. Having less yarn in circulation means less bobbins; less warp beams; less floor space and less liability of stock becoming faded, weakened or injured by much rehandling. In the aggregate, all these advantages makes a vast difference in the profits of the

plant. Confining the patterns to as few shuttles and harnesses as possible also gives the advantage of weaving the goods on higher speed looms.

Start in Designing Room

All these advantages, as must be seen, start with the work being properly laid out in the designing room by the able man in charge. He has used his brains not only in developing the line of goods wanted but made them as simple as practicable to make the manufacturing end simple, easy and rapid, thus protecting his company's interest and giving them the largest possible earning power. On the other hand, if he had placed into the dobby motions work that would have been given as satisfactory effect with the cam motions, more cost would have been incurred in the weaving and the work would have been put through with less speed. This makes a heavy subtraction from the profit side of the ledger.

Ease of Finishing Patterns

It also makes some difference about the finishing as to whether the patterns are easy to finish. The designer must lay out his work so as not to complicate the finisher's efficiency. In one line of goods it is unfortunate if part of them must be finished in one way and the balance in another. And yet this occurs where no thought is given to this. The cords are apt to cause this difference if not properly bound or evenly tensioned. Another troublesome matter is where part of the cloth has alternate stripes woven loosely and the rest tautly woven. If this is not watched carefully it will be hard to finish these goods without leaving zig-zaggy filling stripes.

Economy

In putting the work through the pattern room the careful designer is prudent, looking out for every economical principle. He keeps everybody busy and carries no surplus help. He looks out that no unnecessary waste is made. He does not endeavor to run a dozen looms on sample work when he can put through all his work on six looms. And on the sug-

gestion or sample work looms, he only weaves sample work. If a series of sample cuts are wanted, the endeavor should be to be able to start weaving a line of goods early enough before delivery is wanted to take the first cut off each style from the regular warps when they are weaving the entire line. This system may at times require the mill to carry the entire line of goods in stock until ordered shipped; but if the mill can stand it, it is far more preferable than to make sample cuts by the much more expensive pattern room hand-work system.

Filing Construction Figures

After all has been said on the manufacturing side, there is yet the important system of recording and filing the construction figures. This is a whole chapter by itself. To be brief, all can be said by stating that each line of goods should be filed in swatches of each style and patterns, by itself, and attached to each swatch there should be the organization figures. Every pattern must be properly numbered and a suitable index kept up to give quick location of anything wanted.

The expert designer has a great work before him, and he is an invaluable man when he takes good care of his employer's new business at the embryonic stage.

HOMOGENEOUS SERVICE

It has often been noticed that a wagon-load could not be hauled out of a rut simply because the horses did not pull together. If the horses had only pulled together the load could easily have been started and all would have gone smoothly.

Of the Greatest Importance

The above common occurrence is, figuratively, what happens in a mill where the principal workers do not pull together. In a mill it is of the greatest importance that the

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help give a homogeneous service, i. e., they must be of one mind and pull at the load together, if the best results are to be obtained. How often we hear it said, of some mills, that the men are not pulling together; that there is favoritism shown; that there is no head or tail; and men are working against each other. These stories vary in intensity from very mild cases to such serious eruptions that the situation becomes almost unbearable to those who come in contact with the actual conditions. No doubt there is always a good measure of exaggeration, when people discuss these things outside, but they should close their ears to street talk of that kind. However that may be, excepting where a corporation is well organized with reference to securing a strictly high degree of homogeneous service, there are sure to be more or less internal troubles resulting from factions, partiality and misunderstandings. When this condition of affairs exists, it savors of much hard feelings, and the good work that might be done suffers for want of the really good-natured zest that should be within every worker. Help cannot do their best when soured or hampered by factions that interfere. It therefore follows that anything which interferes with the progress of the plant, even in this way, is wrong and out of place. It is an old sore, but easy to heal.

The General Manager

There is a way out of this dilemma; and the medicine that can heal these disturbances is in the tool-chest of the general manager. He should be the center from which radiates the power that keeps the entire force of help pulling at the load together. He should be the centripital force that draws everything to the center of the company's welfare, and then you have a homogeneous service throughout the plant. The reverse of this is usually found where the manager is careless himself and does not keep his place. In this case he is the centrifugal force that drives his subordinates into confusion, and then the common help follows by giving a heterogeneous service. That is, the help do not pull together. Every little while somebody flies away at a tangent from the

center and hampers the good work that could be accomplished.

The Thing To Do

Now a few lessons to the coming manager along these lines. The thing to do is to definitely lay out the work to each subordinate. Positively have no misunderstanding between the authority of one man and that of another. It is a bad thing to mince matters. Do not have the halo of mysterious distinction hanging over the head of any walking delegate. Halos are nice things to have in sight when writing poetry, but in the mill halos are harmful things and are not wanted. The man must be seen and known as he is without having to look through a halo with a spyglass to get at him. If a man is an assistant superintendent, tell him so; and firmly introduce him to the overseers as such, and determine upon having the office protected and respected as such. The same can be said of any other official. Have it clearly stated and understood just what a man's position is. Half of a man's success depends upon being properly introduced to his subordinates. It is also as important that he knows to whom he is responsible and from whom he gets his orders. There is no more abused man on earth than an official whose position is indefinitely or incorrectly stated.

Meddlers

Never have, nor tolerate, any meddlers around. Every man should be given to understand to remain at his own duties. There is no more pitiful as well as laughable situation than that of a man walking through a plant, having the appearance of being vested with some important authority, and yet having none, and who does not exactly know what his position is, nor do those know who are supposed to listen to his orders. The situation is rendered worse when this man delights to carry with himself that mysterious air which makes people wonder, after all, if he is the chairman of the stockholders or simply a visiting curiosity. These elaborate ornaments, figure-heads, and mixups are bad things for any

mill. Everything should be straight, clear and businesslike. If some mills would realize how dearly they are paying for such experiences there would be less of them. The entire working force of employes should be led to think as nearly like the master mind as possible, and to pull with him.

Giving Orders

Having laid out the duties of each man, the next thing to do is to see that all orders to be given, and business to be transacted, are respectfully submitted each to its proper head. It will bear repeating emphatically:—let all orders follow into their proper channel. It is disheartening to an overseer or superintendent to find that his superior officer has ignored him and given orders over his head. A man can hardly keep up his interest and hold up his self-respect if his superior brushes him aside, as it were, and passes orders by him to his help. It simply does not work to a good advantage, it never did, and never can work rightly. In fact, when it is considered how seriously a man suffers humiliation when he finds that information has reached his help that should have rightly come through him first, it is cruel to treat a good man thus, although it is to be taken for granted that cruelty was not intended. Many a man is doing his level best for his boss, and yet, all of a sudden he finds that an order has been given over his head which gives him the heartache for a week. In cases of this kind a man is justified in seeking an interview with his boss and endeavoring to kindly arrange and bring about the better and higher method. So serious is this matter that it is time that it was written about and ideas exchanged on the subject.

The Bestowing of Orders

The last deal in this lesson is to give your man proper authority. Give him all the authority he needs to carry on your work. Give him the authority that measures up to the position he holds. If he is an overseer properly selected he has good judgment enough to hire his own help and to discharge for cause any wrongdoer that deserves to be dis-

charged. If a superintendent has been properly selected, he is capable of hiring his own overseers and of managing them. If the manager has a man he would like to have engaged to fill a vacancy for good and sufficient reasons, and he believes this man could get along with the superintendent, let him tell the superintendent all about it. If the latter is of the right sort he will no doubt esteem it a great favor to be in position to hire his manager's choice. But remember, by all means, to let your superintendent hire that man, and if he does not want him, do not stand in his way. He is anxious to give you big results, and he can do it best with the man whom he feels certain he can work with. As a rule a man will be the most loyal to the official who engaged him. It is human nature. It is wrong for a manager to hire an overseer to work under his superintendent and expect the best of results. In a case like that it is next to impossible to make ends meet. The only way by which it can be remedied is to let the relationship come to a point where the superintendent must show his authority by hiring the man over again on his own basis, if he wants him and he cares to remain at his old post. This settles the issue as a rule.

Pulling together is the only right policy.

Let no misunderstandings prevail, and success is coined for all concerned.

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*COTTON MANUFACTURING IN NEW ENGLAND

Cotton manufacturing is too firmly rooted into the bone and sinew of New England to undergo the radical changes that some theorists and speculators would have us believe. The way some of them spin yarns and magnify New England depression, the unsound thinker would believe that the whistles of some mills had blown their final blast to summon help to work. The generous invitations of our Southern friends to move our mills into their borders are so cordially

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presented that the thoughtless and unsettled enthusiasts would have us produce the jackscrews and rolls, jack up the mills, start a general moving campaign to stampede our plants to the South Land. However, the Palm Land and the unsettled New Englander should consider that the time is not ripe for such a momentous occasion. The time is likely to remain unripe for such a move. The world is very large and the all-wise Creator has so balanced and proportioned its area and resources with reference to His people, that there is material prosperity in store for all the nations of the earth who are willing to work in their respective lands.

To calm the disturbed mind of those who believe that the cotton industries of New England must eventually be transferred to the cotton fields, let us go over the ground and survey the facts in hand.

Not many generations ago there was great disturbance across the Atlantic because cotton manufacturing was gaining a foothold in New England, not far from the greatest cotton growing fields of the world. History and tradition reveal the forebodings of our over-anxious forefathers. Many were positive that the cotton industries of the mother country would be ruined and that all must move to the new world. But time has made her speech. England still leads the world in the number of spindels, and leads in some lines of very fine goods. The writer uses this illustration to show about what relationship may be expected between New England and the South in the future. Both will have their proper place in the cotton commercial world and excel in special lines of goods. The prestige of New England is here to stay as surely as the cotton grows. Whatever differences may come up in regard to local conditions, whether of quantity, quality or profits, all these changes will take place with perfect equanimity and for the good of all mankind.

For a substantial reminder of the stability of the New England cotton manufacturing business, we can point to the present foresight of New England investors in the recent erection of many new mills at home. No doubt many others will be built in New England to make fine goods in the course of the next few years.

There is any amount of barren land between Fall River, New Bedford and other points and Boston, that is admirably adapted for cotton mill sites.

The writer is firm in his belief that a cotton manufacturing plant built away in the woods by itself, same as in the old New England days, and as is done in the South now, and having its own neat tenement houses, provision store, spur railroad track from a trunk line; in other words, an up-to-date corporation cotton mill town owned by the company, would pay a handsome return on the capital invested and pay dividends that would satisfy the most conservative investor. There is a large number of such corporations in New England today, and although their equipments throughout are far from being modern, they are on an average fairly prosperous, while some plants are very prosperous.

That a corporation owning its provision store, tenement houses and farm, has a great advantage over the individual mill, goes without comment. It enjoys about the same privileges that the large multi-department store has over the small single department store. The comparison is fair and obvious.

When it is taken into consideration that a 100,000 spindle mill with its own provision store to feed a factory village of about 5,000 people, can clear $35,000 to $40,000 per year, it makes a vast difference as to the profits of a corporation. A similar amount is an assured income from the tenement houses, and no loss bills, practically, in either case.

A corporation farm, when well managed, is another paying factor which enters a large item on the profit side of the books, possibly $5,000 to $10,000 per year.

It must not be inferred that a mill cannot make money in New England and not own its tenements and provision store. These special departments are merely mentioned to show some of the advantages a mill derives from this form of investment over those that are without them.

In Fall River few cotton mills have any income outside of the mills themselves. An ideal situation for Fall River would be for mill owners to build several mills for the manu-

facture of very fine goods, and use the waste products in the coarse goods mills. This is assuming that each fine goods plant would be owned by a coarse goods company.

In any event the cotton industries of New England are quite contented to remain where they are for some generations to come.

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*HAVE WE TOO MANY COTTON MILLS?

In connection with the recent cotton mill booms, the oft repeated question, Have we too many cotton mills? comes to the surface again. This question has been asked many times since the introduction of cotton manufacturing into this country. There are two periods in history when this appeared to be a momentous question to the public. The most serious period at which it was asked was when England noticed that cotton manufacturing was gaining ground or a new home in America. However, as New England developed into a great cotton manufacturing centre, England grew proportionately and steadily and suffered no inconvenience from her new born "babes in the woods" of America. Thus the question answered itself in the affirmative. The world was expanding. It needed more mills and *newer* ones.

The next time this question was asked was at a more recent period, and from a world-wide standpoint it was less seriously asked. But to New England it meant a serious question. The great question was: "Shall the cotton manufacturing business be moved South or shall it remain in New England?" And for a second time this question was answered in the same good way. The world was growing and required more and better cotton mills, and no harm has come forth from this latter movement.

This question hos been asked many times since, but each time that it is asked it is asked less seriously, and is always answered in the same good way.

Coming down to present day affairs, there are some

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cotton mill booms in force and the same old question looms up from many quarters, but it is not seriously asked. While this same old question can be answered very much in the same way as of yore, there are some more modern complication which enter the "new mill" question and which satisfies the new mill builder more than the question of mere "expansion" does.

To study this question from a modern light may let our interrogators "down easy." The question today is not so much "Do we need more cotton mills?" as it is do we need some more modern mills and better managed mills? The question now is not sectional or one which considers location so much; neither does it treat so much of the utility of the scheme. The question from a modern standpoint is more of an economic question; that is, it is not so much have we too many cotton mills. The modern man asks himself some very pertinent questions in connection with his new mill scheme. Here are some of them: "Can I with the latest improved machinery or by my better knowledge of the practical end, or of the commercial end, secure a market and hold it on a paying basis? In other words, can I be the "survival of the fittest?" This leads us to follow up many points of value which bear economically upon the building and the managing of a new mill.

Everything else being equal, if one mill has better receiving and shipping facilities, it is bound to make more money than one which has unfavorable inlet and outlet. The new mill of today is not so much to fill the want or requirement of more goods, but to fill the want of better or more economical conditions therewith. It must also be borne in mind that not all new mills are an addition to the industrial system. It must be taken into account that every year many mills drop out of commission. Some are burned and are not rebuilt; some die a natural death, as it were, by being allowed to wear out; others become obsolete because of local obstacles which cannot be overcome—there may not be room or ground upon which to expand, as it must, to compete with the new and larger mills that go up under more favorable con-

ditions, and the stakes are pulled out and the plant dropped. So it is seen that many new mills are renewals or replacement of old mills, and not altogether additions to the world's industrial and market movements. However, as a rule a new mill stands many advantages from a physical standpoint alone over one which has been in operation even only a few years. Even five years suffices for the mechanical world to so radically improve cotton mill machinery as to make the five-year-old plant man wish his plant had the latest improvements. To exaggerate, it is a *new* saying that the machinery builders send their men around to tell you that what was purchased last year needs to be replaced today, because they have in the meantime so greatly improved the same.

This only serves to illustrate the point. Still, the new man (and the old man) who keeps himself *new* and his new mill *new*, usually goes further with his plans; he does not depend entirely upon his plant because of its physical superiority; he knows that this soon wears off in a measure. The new man looks into some of the following permanent advantages, and he either couples on to his scheme one or more—and all, if he can—of such advantages as these: Good location, plenty of capital, good building material and good workmanship in both buildings and machinery; the specially good arrangement of buildings and machinery with reference to facilitating the processes; big and prudent purchasing power; the manufacturing of something new or old that is wanted in large quantities to avoid frequent changes. The new man may have the monopoly of some specially good invention. The most important of all, is to have a strong following of good help; if the help is well organized and each has the interests of the new mill at stake, and all know how to make the goods, that mill is bound to succeed.

Even when there are many other disadvantages, if the new mill man has a homogeneous force of hands who follow his lead and are true to his governing policy, he will give the older manager and his old mill a long lead if he lacks this one advantage. Another man's stronghold may lay in his business wisdom and foresight to grasp a waiting market for

something that he knows just how to make to better advantage than anyone else. He buys the raw material when the market is down, and sells the finished goods when the market price of same is up.

In closing, the strictly up-to-date manufacturer who is fully equipped and has a modern mill to operate, is certain of success.

He can build a new mill any time and be sure of his success. His strength can be compared to the bear who held the little boy at bay, as the story goes: "A *terrified* little boy stood within embracing reach of a great bear, and the bear said to the boy: "And whose little boy are you?" To which the boy replied: "I's you'se little boy!" The bear was sure to succeed. So is the man who *knows* his trade in the broadest sense. He is certain of success, and the market, like the "little boy," yields to his wants.

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*THE PROPER CARE OF MACHINERY

Taking proper care of machinery, to keep it at its highest productive efficiency, is an important consideration. The life of the machinery is the life of the plant. The earning capacity of a mill depends upon and is limited to the maximum production of its machinery. It certainly makes a vast difference as to whether the mill is securing 75 per cent. or 95 per cent. of its possible production; and any extra good care that can be given to the machinery, which would increase the productive efficiency 5 to 20 per cent. without increasing the cost proportionately, is surely worth working for. That the machinery in a cotton mill requires proper care to keep it alive, is well known by most men who hold responsible positions in connection therewith.

The equipment of machinery, in any modern cotton mill, represents a vast deal of capital at the start, but its value after being in operation a few years is quite another consideration, depending, of course, a good deal on the length

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of time it has been in service and on the care it has received during that time. Machinery, like most anything else, deteriorates in efficiency and, therefore in value, faster on account of improper care than on account of the length of time it has been in operation.

First, it wears out, naturally or unnaturally, beyond a point where it is economy to use it. It may wear out unnaturally, or in other words, too fast or unreasonably, on several accounts—possibly for want of proper oiling, or because of improper adjustment of the working parts. Belting and banding machinery too tight causes great wear and tear. It may wear out too fast on account of over-speeding, also, because of being roughly handled by the help, and not being kept clean. Overloading the machinery with work too heavy and not adapted to same will shorten its life. So will manufacturing from poor stock, also poor iron and steel, and poor workmanship in its construction. The same can be said of machinery that is allowed to stand idle and rust away. Even good machinery, like a good man or a trotting horse, needs exercise to keep it at its best. So we have, at the least, twelve causes given to show how machinery wears out, viz: The natural wear and tear which cannot be avoided, and the eleven other causes given that *can* be avoided. We are all agreed that machinery in charge of intelligent and skilled men should never be allowed to wear out, for want of oiling; for want of proper adjusting, proper cleaning, proper speeding or proper handling by the operatives, etc. And yet there have been new mills in operation, right here in New England, that had not run five years before the machinery showed marked unnatural wear because of improper care. The same can be said of some new mills that were started in the South some years ago. As this is really so, and so many new mills are now being built, a paper on this subject, calling attention to the remedy for this evil, may prove of some value to our association.

In starting a new mill great care should be taken to select a superintendent who not only knows the processes, and how to manage help, so as to produce a maximum production of

the right quality at a low cost, but it is also highly essential that he should be one who also knows his duty with reference to taking proper care of machinery. In starting a new mill the common help should be carefully selected, and each hand trained to properly oil, clean and not use the machinery roughly. What is meant by using the machinery roughly is, that some of the help become careless and "bang" things around as though they were playing foot-ball. In cleaning around machinery, when they are not careful to stop the machines as they should, in wiping or brushing certain dangerous places, they let a brush, broom or waste get caught and injure the machinery. In moving up and down in the alleys, between the machines, people oftentimes run into the sides, or against the ends of same, breaking parts and driving the machinery out of line.

Spindles on roving machinery, spinning frames, twisters, spoolers, and other machinery, become bent by pulling at them sidewise. Fluted, steel drawing rolls, on all machines thus equipped, are the most shamefully abused of any machine in the mill. The help, if not well trained, cautioned and watched on these things, will use knives, steel hooks, and even iron weights or hammers to remove waste that has been wound onto the rolls when the ends have broken. (Only soft brass wire hooks should ever be used for this purpose). Some mills are running badly today and making much bad work on this account. Show us a mill where the machinery has been well cared for, by a good organization from the start, and we will find plenty of good help, good running work, plenty of production coming off at a low cost, and a contented organization all the way through—because all are giving good results and getting a better income for the mill and for themselves. This important matter makes a vast difference in the earning capacity of a mill, as all of you know. This paper is not intended to cover the entire field of the subject. Time is too limited for that. It is only intended to open the subject for discussion, if desired, as it is an important subject.

It is a fact, too, that machinery needs a rest—a vacation

as it were—same as the workers do. A machine that is run continuously, day and night, cannot last so long as when operated the same length of time intermittently. And, the men who have discovered this advantage are today getting the highest productive efficiency and the cream of good work. It repays handsomely to stop a machine periodically and thoroughly overhaul it, cleaning every part and re-setting or re-adjusting everything. This kind of a halt, like a frame stopped to doff, is a revenue-bearing one and is as necessary. A wise manager never finds fault when he sees a machine stopped and being put into perfect order to run another race. He does not do as the uninformed stockholder did once. Some time ago a stockholder, not familiar with mill work, and being anxious about his investment, was being escorted through the mill, when he saw a frame stopped to doff. Said he, "What is this stopped for?" "Stopped to doff," said the section hand. To which the over-anxious investor replied: "Now, young man, you want to keep these machines running and never let this thing happen again. This doffing business will ruin us!"

The fixers must also be taught to do their part. They also have an important part to play in this matter. They should not use a sledge hammer where a tack hammer would answer the purpose. They should adjust the different working parts so that each machine works freely and under the least strain. This saves oil and power as well as the machinery. It also saves labor, help, and gives a longer productive run. It also makes evener work as well as more of it. Keeping the machinery clean will do the same things just mentioned. Where the belts and the bandings are not put on too tight we may also add the same advantages just specified. When these are too tight it may increase the friction load 25 per cent. or more than it should be. Keeping the machinery level and in line is another economical point to bear in mind all the time. It is false economy to let machinery go for several years without leveling and lining it—in fact, it is well known by mechanics that a machine which has not been leveled for years, if leveled, it will

not run. Everything binds. It must be kept level all the time. Some wise manufacturers do this. Again, the matter of speed enters into this problem. It is a fact that when some good managers take charge of a mill, the first thing they do is to reduce the speed of some of the overspeeded machinery; and immediately they get off a larger production and a better grade of work than previously. What does this mean? This also means less power going to waste, less wear and tear of the machinery; and much more contented workers, because, even the larger production of a better quality is more easily secured than the poorer production on the higher speed at times when it is over speeded.

Again, machinery deteriorates in efficiency and value because it becomes too old to compete with modern improved machinery. This time is bound to arrive, sooner or later, according to the progress of the machine builders. However, old machinery that has had good care, kept in first-class repair, and latest improved mechanisms applied, from time to time, when possible, will give a long chase before becoming wholly unprofitable to use. Although the old equipment may be in good running order, it is also well not only to watch the repair account, but it is well to consider what the loss is in operating old machinery, when compared with the figures that modern machinery give. There comes a time when it is folly to operate an old machine when a new one would rapidly pay for itself and soon be giving dividends that the old equipment could never bring. It is false economy to repair a machine beyond the economical range. This can be illustrated by a young man who carried a jack-knife for some time. It had often been repaired. Finally he showed this knife to his friends, and he asked them if it was the same old knife—and at once the house divided. Some said it was the same old knife, while the rest declared that it was a new one. Whereupon, he got all the old parts, put them together and produced another knife, and he found that he had neither the old knife nor the new one. The best knife he had was not worth carrying, and it cost him

more to put it together, by so much intermittent repairing, than what he would have had to pay for three, good, brand new knives. It would have paid him to throw away the old knife at an earlier stage of the repairing. And so it is with machinery. Take good care of the old machinery, so long as it is worth the care. After that, buy new machinery and scrap the old. It is advisable to have a good system of inspection that will eliminate the possibility of machinery being neglected in any department of the plant. Any system of thorough inspection that can prevent this neglect is commendable. The modern, well managed plant calculates to avoid every possible disaster—always bearing the principle in mind that "an ounce of prevention is worth a ton of cure." To this end, the power plant units not only undergo constant watchfulness, but a weekly thorough inspection is made of these units, together with every main driving arrangement until the entire driving gear and the remotest counter belt in the plant is inspected. The whole idea is to avoid having any kind of a break-down, and have the mill run solid time, year in and year out. Many mills accomplish this to their great credit. Apply this same eternal vigilance to the entire force of overseers, second-hands and section men. Institute in the minds of all these men the value of being on the everlasting daily *lookout* to prevent any possible neglect here and there. Have these men take time to kindly train their help to take pride in doing their part, and urge them never to neglect reporting the slightest irregularity about the movements of their respective machines. In this way many lesser and more disastrous breaks are prevented. And then every man of responsibility should make his own thorough inspection to satisfy himself that things are being attended to all along the line, the whole idea being to give every individual machine solid running time so far as possible. A good system is to number each machine in the mill and keep the repair account of each one. This locates carelessness and excessive breakages at any point in the plant.

Lastly. The care of surplus machinery, when idle, should

claim a portion of our attention. In some mills it is necessary to have some surplus machinery on account of changing from narrow to wide goods, etc., particularly in a colored goods mill. When the surplus machines are idle they should be thoroughly cleaned, and every precaution taken to protect all parts against liability to rust, and then covered preferably with waterproof coverings. Following this, orders should be given that robbing these machines of any part to repair other machines is strictly prohibited. It is unfair and cruel to the company to steal parts from temporarily idle machinery. If all the machinery in the mill is not complete and ready to run, the conditions are wrong. The assets are not all there. And worse than this, when this idle machinery may be wanted, at a moment's notice, it might take a month to re-assemble the parts. Meantime, valuable orders are delayed in process, then follows the cancellation of the goods. These things have happened.

The only safe methods of management is to give the machinery proper care, to keep the plant whole all the time, also to keep the plant running all the time, and to keep a complete production of first quality goods coming all the time. And then it will not be necessary to borrow money to pay the taxes!!

MIRTHFUL YARNS

The Ridiculous Side of Mill Life May Afford Amusement to the Reader

There is a wise saw which reads: "All work and no play makes Jack a dull boy." While we are learning to card, spin and weave it may not be amiss to pause and note some of the funny things which happen now and then to lighten the burden. It is a mistaken notion many men have that in order to be dignified and hold responsible positions they must never smile, and that the face which rules must ever carry the caste of severity. Alas! this is unfortunate. The face that never smiles is like the block of marble which has

not been polished, or like an unpainted house. It is not finished and lacks lustre, and does not command so much force. On the other hand, the bright, firm, cheerful face carries weight with it wherever it goes. And when it gives a courteous smile at the ludicrous side of things now and then in the right place, it betrays no weakness and strengthens the atmosphere. Like a little oil on a dry bearing, a well-meaning jest once in a while has its place. It breaks up the monotony and relieves the tension of strenuous service. The ordinary help catch the spirit and turn off more work. It is an erroneous idea that an overseer or manager should march forth among his subordinates carrying a club in one hand and a lash in the other. As the pen has been found to be mightier than the sword, so the man who leads is mightier than the man who drives. The great captains and generals of warfare have won victories by their strong, valiant leadership. The same relative results can be obtained from the armies of textile workers by kind, strong leadership. Never in the history of the art has there been such a strong demand for leaders instead of grim drivers and pushers. The great source of power should be at the head, like the locomotive which pulls the train.

And so the writer has laid aside the technical side of the art to touch upon the ethical side. One is as necessary as the other for the expert tradesman to succeed. In the textile mill, as elsewhere, there are some funny things that take place. In this paper it is proposed to review some of them.

Some years ago, before the South patterned and equipped its cotton mills in the most modern fashion, there were some funny stories about its old mills. Of one mill it was said that the floor of the weave room had sagged so much on one side that it was unnecessary to have picker sticks on the high side of the looms, because the shuttles would always return by gravitation and never miss a pick.

As the South developed the tables turned. There remained yet in some isolated parts of New England a few old mills having some machinery which had universal joints, and the shafting, instead of being coupled with compression

coupling, was connected by universal joints. In the South they delight to tell of such mills "up North" which did not need regulators on the water wheels, nor governors on the engine. If one end of the mill went too fast the other end would fall back. If the speed of the engine dropped, there was so much play and back-lashing in all connections that the momentum neutralized the difference.

There was in a high grade mill a good fixer, who carried almost a chest full of tools in his pockets. One day a fixer in the adjoining section said to this walking tool chest: "Have you got your 24-inch monkey wrench in your inside vest pocket?"

A green fireman was asked what pressure of steam he carried in his boilers. "Three hundred pounds," said he. "How's that?" asked the superintendent. "I've got three boilers each carrying 100 pounds pressure, and altogether it makes 300 pounds pressure."

It might have been this same fireman who, when asked to tell what steam is, replied that "steam is cold water gone crazy with the heat."

A party of school-teachers were being escorted through a mill. The overseer was not explaining the processes fast enough for them, and when they came to the carding room one of the bright school marms exclaimed: "O! how fine—is this what is called a loom?"

A young super was being escorted through a large mill by the genial superintendent. Finally the young super became impressed with the ease and leisure with which this great super managed and went about his vast plant, and he ventured to ask him: "By the way, what is the hardest thing you have ever had to do in connection with this job?" To which the great super replied: "The hardest thing I've ever had to do was to get the job."

In a certain mill there was a long cloth belt which was too slack to run. It was a new belt and no one at this place had any experience with the care of cloth belting. This belt was so slack that it was deemed best to cut off about six inches, so this was done. They were slow in doing this job,

and while the belt was off the pulleys it shrank a foot. After several desperate and futile attempts to replace the belt onto the pulleys, it was decided to replace part of the piece which was removed, but it was still too short. Then they put in the rest of the part removed, and still it would not go on. It was finally found necessary to put in one foot more into the belt before it could be thrown on.

A family from Canada had come to New England to earn a livelihood in a cotton mill. When the parents were told that no child under 14 years of age could be employed during school time, they entertained some fears as to their success in obtaining work. Each child was speedily drilled to answer properly when any official inquired as to his age. Finally the factory inspector made his tour of inspection. When a member of this drilled family was quizzed the outcome was as follows: "How old are you, my boy?" "Fourteen years." "How old is your sister?" "Fourteen." "How old are your father and mother?" "Fourteen." The whole family was 14 years old.

Another case of factory inspection revealed a much named individual. In the mill this person's name was a triple measure. She had a special name for her friends to call her by. On the pay roll she went by a different name, and the school certificate disclosed that she was known by still another name. "How's this?" said the inspector. "Well," said she, "so and so is my real name, the name on the time book is what my mother calls me, and the name on the certificate is my grandmother's name, the name I go by."

There was a boy in a southern mill who would, when the speed had slackened sufficiently, take hold of a belt and allow himself to be drawn up a few feet and then drop by gravitation. He became well accustomed to doing this trick, when his dexterity deceived him. One day he grasped the belt when the speed was too swift and rode completely over the shafting and landed on the other side without receiving a scratch.

Said a smart overseer: "I like to hire tall hands, because they do not have to go around into the opposite alley to piece

ends. They can reach over the machines and piece the ends."

A foreigner desired to be out for an hour or so one day. But, said he to the overseer, "if you cannot spare me I'll not step out—there's going to be a wedding—it's me that's to be married, and I'd like to be present!"

The president of a new mill was being escorted through a cotton mill for the first time. He saw a spinning frame stopped, and he asked the overseer why this machine was idle. "Stopped to doff," said the overseer. "Don't ever let that happen again," said the much concerned president.

The Fall River Iron Works mills have a tall smoke-stack, about 400 feet high. It is said that it takes two men and a small boy to see the top of this chimney—one man looks as high as he can, then the other man begins where he left off, and between them and the boy they see the top!!!

THE MILL OFFICE AND THE SUPERINTENDENT

The relation of the coming man and the office end of a cotton mill is one which is highly important to consider and adjust, and yet this is a matter which is not given its due consideration in connection with the rise of an overseer to the management of a mill. While it is of the utmost importance that an overseer be an excellent manufacturer, it is also of great value to him to have considerable knowledge of the business end, to be unhampered in his promotion to a superintendency. As a rule the overseer who is promoted to higher service knows at least one department of the mill thoroughly. He has also been a close observer of the other departments, has studied and trained himself by every fair advantage to gain a stronghold upon the essential requisites of what he needs to understand about the other departments.

Superintendents have not only been selected from the manufacturing end, but from most every point of connection with a mill. Although they are quite evenly distributed between carders, spinners and weavers, many have won distinction as good managers who have been selected from the

finishing, designing, mechanical and accounting departments. But in any case they are all, as a rule, broad, capable men who have grasped every opportunity to render themselves useful beyond their own special departments, and secured business training that enabled them to measure up to many petty as well as more grave requirements of the office end of the business.

It is, therefore, of great advantage for a man, both for himself and the interests of his company, to familiarize himself with the office end of the trade, and meet it on its own ground. It is to this end that this article is prepared, and suggestions formulated whereby those who are not acquainted with this end, and would like to review and ascertain some of the office requirements, can gain some knowledge of this important branch and be better prepared to stand their ground.

In the first place a man should accustom himself to being a good legible writer. Almost any man, no matter how illegibly he may write, can greatly improve his hand by taking twelve or twenty-four writing lessons and practicing half an hour each day for three to six months. He should accustom himself to taking notes rapidly, and be quick to interpret notes handed to him. As an overseer he has a limited experience in this line. His notes have been few and he has had plenty of time to produce them and interpret those sent to him. When he becomes manager he may be flooded with dozens of details at one time, and will wish he had as many hands to jot them down. Hence the importance of being able to take and make notes rapidly and abbreviating them so that the all-important points are not lost sight of. The would-be manager should also be quick to read and decipher his treasurer's abbreviated notes, of which he will get many at different times.

Another valuable training required is the art of tabulating and recording intelligently original results of tests, processes and averages. It often occurs that a superintendent is called upon to render reports of his findings in various lines to his treasurer, and such reports should have

a scholarly demeanor, which indicates grasp of the subject to its fullest extent.

Incorrect spelling is another draw-back to the practical man. Good spelling and correct syntax should be the exclusive rule. Another virture well worth cultivating is the art of filing records and having system so well in hand that search is reduced to a science. The man who "had (?) that paper," and "knows just where it is," "and can't find it," is very common, simply because of his lack of previous training. Unless a man trains himself into these preliminary official requirements, he will be seriously handicapped in his advanced positions.

The writer calls the above only preliminaries suggestively, because the man is now only on the eve of his office particulars. He must have vastly broader insight into the office yet, if he would sing well to its music. The cotton mill office is more than a row of oak desks, some clerks and a clock. (There are, of course, some mill offices into which the most important thing about it is the clock on the wall).

For the benefit of our students we will dissect the office into its component divisions and show that a well-governed accounting room has no chaos about it. Everything is so well systematized that if a man will familiarize himself with its divisions and sub-departments he will have the key to strengthen the interests of the company to a considerable extent. The writer does not mean by this that the proposed manager should be a good book-keeper himself; for this is not necessary. But he should know the situation sufficiently well to be able to grasp things and know whether the accounts are kept as they should be to give a clear understanding of the local plant, and in such a way that no losses are sustained by misplacement of manufacturing details. Book-keepers are many, but few strictly understand the relation of the manufacturing end to the accounting end. If they are not watched oftentimes they will charge supplies to the wrong department. Heavy bills like those paid for machinery or repairs may be charged to supplies instead of to equipment. Items entered like this will cause

the mill to show less earning capacity for the time being or total loss; while, on the other hand, if such items are charged to equipment, thus increasing the permanent value of the plant, only interest should be charged to the manufacturing end, and the mill would show profit instead of a loss. Thus the bright reader now more readily understands the necessity of knowing how to "do things" a la proper accounting.

But the overseer asks himself, can these things really occur in an office where skilled men are paid to scale proportions to a science? The writer begs to advise that the office needs as careful supervision by the manager to protect the company's due averages and percentages as the manufacturing does, because they often do make bad mistakes for want of advice from the manufacturing agent. Some of these points will be illustrated as we proceed with our paper on this important subject.

As the financial success of a cotton manufacturing corporation rests with the treasurer, he is held directly responsible for the accounting department and the proper conducting of its affairs. If he is a resident treasurer, as most of the treasurers of the cotton mills of Fall River are, he will have immediate charge and oversight of the company's business. He will have a competent superintendent to take full charge of the manufacturing of the goods, and an expert accountant to take charge of the accounting in detail. If the treasurer is not a resident officer, the local affairs may be under the immediate charge of a resident agent or superintendent.

The chief accountant or the head bookkeeper, so called, is held responsible for the routine details. It is his business to follow up, daily, the enormous ingathering of fragmentary business documents that come from all departments of the plant, and from all corners of the land. The fragmentary documents cover almost every conceivable subject from a parcel of court plaster to the source of a river.

It is evident that there must be system and crew of assistants to maintain order out of chaos. The competent

office manager will select his assistants with great care. To him they must be known for their integrity, honesty, industry, have clean, obliging manners, and be free from gossip. They must be sworn in, as it were, to eternally protect the company's interest by every fair advantage within their means, and not divulge the private matters of the clerical court.

In opening the accounts of an office and starting the routine details, the office manager will systematize the work. A well governed office is divided into general departments covering every phase of the businss with reference to the accounting, and are esesntially as follows:

Organization.
Pay Roll.
Correspondence.
Purchasing.
Receiving.
Advertising.
Orders.
Sales.
Manufacturing.
Dye house, Bleachery and Designing.
Shipping.
Exchange.
Stock Account.
Profit and Loss.
Tenement.
Farming.
Provision Store.
Yard.
Welfare Work.
Enginering.
General Expenses.
Earning Capacity.
Bank Account.
Auditing.
Secret Service.
Diary and Statistical.
Economy in the Office.
Cost Finding.

Taking the general departments in the order mentioned, it may prove of interest to follow the details in connection therewith. In small mills and in other mills individually owned, where no attempt is made to have an elaborate form of office work, a good accountant may do all the work, or he may have one or two clerks to assist him. But in a large corporation doing an extensive business, and requiring complete up-to-date methods, it will require a large force to perform the work. In this case, which we take up and illustrate, a clerk is assigned one or more departments to which he devotes his time exclusively.

Organization

The first matter which comes up is the opening of a set of books. One of which will contain the list of stockholders and their addresses; capital stock; amount paid in, and par value. A board of directors is elected and they in turn determine the policy of the company, elect a list of officers and outline their respective duties. The date of their annual meeting is decided upon and business proceeds about as represented under the following different departments.

The Pay-Roll

In regard to the pay-roll, this is a department to which close attention will amply repay the company. The general superintendent must see that the pay-rolls of each department in the mill are uniformly made out. In some mills each overseer has a whim or method of his own to keep the time. Some may enter the time once per day, others twice per week; one may put down the time in hours, another by days; the rates in one case may be posted at a price per day, while in another case the rate may be by the week, day or hour; and there is a further confusion when one man figures out the pay-roll by decimals and others by fraction. The object of the pay-roll is to keep the time properly and pay each person what is agreed. Unless the methods are uniform throughout the plant many who work in different parts of the plant, even at the same rate per day, may receive different amounts. The object of the superintendent must be entirely to eliminate such needless confusion. He should insist that all employes are treated by the same methods. The writer has seen this confusion in some mills, and the office end never interfere or offer a suggestion to create uniformity.

Here is where the manager steps in and renders himself useful. He should also insist that no errors be made in putting the money into the envelopes in the office. A careful method of checking eliminates this evil. Help that are systematically and correctly paid have more confidence and are better satisfied than where frequent mistakes have to be rectified.

Another factor which enters the pay-roll section is the matter of dividing or putting the costs where they belong. It is unfair to borrow a man from one department for a week and not transfer his time to its proper place on the time sheet. The office end does not understand this, and it belongs to the superintendent to see that these matters are properly adjusted so that costs are accurately apportioned. Thus it is noticed, at the outset, that the manufacturer are so closely related that they cannot be separated and operated apart. The executive must keep in touch with the office and know his place there.

This department covers the time keeping. Each department of the mill is assigned a time keeper. There is no department requiring closer application and more accurate reckoning than that which concerns the weekly or periodical payment of employees' wages. It vibrates to the farthest hidden corner of the plant, and is to the workers as oil is to the machinery. It must be done right or there is trouble in the camp.

Help that are systematically and accurately paid, learn to have confidence in the firm and take pride in returning measure for measure. On the other hand, help that are obliged to have errors frequently rectified become careless. This stigma becomes noised about among all the operatives and injures the firm. Therefore, the paymaster should have all the time accurately reckoned and so carefully checked as to avoid errors entirely. All amounts should be proved and no envelope sealed until it has been checked with the pay-roll, and contents inspected to see if same corresponds to the amount called for on the face of the envelope. As a week's work is now known by the number of hours employed, the best method to follow is to enter each worker's time in hours daily, and to pay at a rate per hour instead of at a rate per day, excepting where a price is fixed for those who work by the piece.

Correspondence

This includes all transmitted messages whether by telephone, telegraph, mail or express, all of which should be copied in a loose leaf copying book, and the corresponding answers inserted on the opposite pages. The advantages of this method are obvious to the conversant business man. Having the answer to each business letter immediately on the opposite page, enables one to follow the progressive correspondence upon the subject with rapidity.

A capable superintendent is called upon to handle a great deal of correspondence, all of which he understands how to dispose of with dispatch and proper bearing to each subject. He is not afraid of details, thinks fast, and dictates accordingly. As it is only by correspondence, as a rule, that a plant keeps in touch with the world to hold and enlarge its business, the mail is the life of the plant. It is, therefore, important that an intelligent superintendent keep in touch with and follows up the progressive correspondence, so that he can be alive to the calls of his firm with relation to the public. The man who understands his trade should have access to the correspondence and shape it to his firm's most careful advantage. When the correspondence is not followed by the man at the wheel a great deal of confusion arises from errors. Mistakes are made in ordering supplies; accepting orders for goods that are not adapted for the mill to manufacture. Hence the need of office training for the overseer who aspires to manage a mill.

Purchasing

Under this important heading comes a great question of economy. Not all men are good buyers. Careful buying is an art well worth cultivating. Many large corporations employ an expert buyer—one who knows the wants of cotton mills; is acquainted with the trade at large; keeps in closest touch with market quotations; has tact, and knows just in what proportionate quantitites to purchase, to give his firm every fair advantage.

The stock on hand of mill supplies, and of the mill pro-

vision store (if there is one) is corrected every day and constantly before him. It is so arranged and indexed that the purchaser can tell at a glance what is running low and needs ordering. This is observed so well that the plant is never stalled for want of the required supplies at the right time. In addition to the daily corrected list, he has an indexed and alphabetically arranged ledger which gives list of goods purchased, price paid, from whom purchased, how shipped and whether prepaid.

The expert buyer is very explicit in giving shipping directions. When not practicable to send samples of goods wanted he is minute in giving dimensions, styles, quantities and every possible information that can lead to a prompt and correct filling of the order without further correspondence. To have this work done as directed, means the most economical system that can be adopted by the mills that are always in hot water about their purchasing department.

For the want of a perfect method of buying, the writer has known of mills getting out of coal, short of cotton, have machinery waiting for supplies, and any amount of sour feelings caused by mistakes, and delayed goods, all of which a tactfud buyer can avoid. In this way tracers, telegrams, etc., looking for belated goods, are dispensed with.

This kind of a man, also, when buying special supplies not for the general stock but which is for a particular department of, perhaps, Mill No. 7, has the goods come with an index letter or number on the parcel, case or tag, which indicates its proper place and promptest delivery.

The ordinary buying of supplies of most mills, however, is done by the local agent or when there is no agent, by the superintendent. Heavy supplies, like coal, cotton, etc., are most always purchased by the treasurer, whether he is a local resident, or located away in a large city to keep in closer touch with the trade conditions. In any event, the supplies should be purchased under the most favorable methods indicated.

The mill superintendent needs to be a good buyer, and know where to get good supplies. Many mills have lost vast

sums for want of this ability vested in its supervising head. Again, some managers have special ability in this line, and can earn a great deal of money for their mills, but having no "say" in this department, large losses are incurred because the buying is unwisely transacted by a clerk who cannot possibly realize the situation so well as the man who must use those goods. It must not be inferred that a superintendent should attend to the smallest details himself. But, unless he has a good knowledge of the markets, and can advise properly about the buying, he is oftentimes supervising a losing plant, or not earning so much with his mill as he might. Another element of safety which enters the purchasing proposition, is the proper style of ordering. A wise supervisor will see that his orders for machinery and supplies are specifically given. Vast amounts are lost owing to wrong goods being sent from supply centres, because details were not mentioned. Sizes, styles, quantities, shipping directions should be given in full. And the overseer should think along these lines and be prepared to take in the situation and dictate. When he becomes superintendent he should scan the order sheets and protect the interests at stake.

One more virtue must be attributed to the wise buyer. He cannot be bribed and will purchase where he can secure what his firm needs most, regardless of any private consideration that may be open to him.

Receiving Goods

Having ordered goods it would seem that their arrival is only a matter of course, and that no further attention need be given. However, it is found otherwise. The receiving department is as important as the purchasing, and requires great attention. The man of the moment needs to be on his dignity here as well. For want of attention some goods he may be waiting for are perhaps broken by a careless receiver in opening the box; the parts may not be correctly counted; or the goods may be shelved and fail to reach the department for which they were ordered. What would the

new super do in such a dilemma? He would, if he had given his prospects some future consideration, be prepared to appoint a trusted clerk to receive all goods, and keep a record in a book set aside for this purpose. He would insist upon careful opening of cases, counts, measures, weights, sizes, styles, where from, how transported, for whom purchased, carriage prepaid or not—all these matters he would have properly entered in the receiving book. The receiver should also note his stock on hand and not let the plant become stalled for want of any line of supplies. Unless the coming man looks ahead and lays out for this, he will get caught and suffer. Thus, it is seen that the relation of the manufacturing head and the office are intimate, as we proceed.

Every up-to-date office will have a receiving book in which a daily record of all articles received are entered with all particulars pertaining thereto. The item as entered should state precisely as to whether a box, bale, case, bag, bundle, etc., has been received, via freight, mail or express, prepaid or not prepaid, followed by invoice and specifications of contents, and also enter the index letter or number to show in which department it belongs: to general stock, or to special department.

All these goods are entered as they arrive. The cotton and coal is weighed, all boxes and such things are opened and their contents counted or weighed, as the cases may be, also where and who from. Then the next day the previous day's entering of goods received are sorted out and transferred to their respective pages in the perpetual loose leaf ledger of the purchasing agent, as already illustrated. Both books should have a well-kept index.

The Daily Receiving book is also posted for another very important reason. That is to check the express, freight and cost bills. When these bills arrive, a blue check mark is made at each item to show that transportation charges have been paid. A red check mark may indicate that the cost of the goods is paid.

The receiver of the goods having been provided with a copy of the purchaser's order-sheets accompanied with in-

structions as to where they belong, he knows just where to deliver them and forthwith sees that they are properly distributed and vouched for. As the purchaser has properly ordered the supplies, the same give entire satisfaction to the users. Thus this method avoids misunderstandings, prevents confusion, and the corporation saves perhaps thousands of dollars over the salary paid an expert buyer.

Advertising and Incoming Orders

Upon the incoming orders depend the success of the plant. Having every facility for making attractive, service able goods, is not sufficient. There must be a department of publicity or advertising agency through which patronage is solicited. The manufacturer who knows every detail, and superior advantage at his disposal for making a fine line of goods, is very likely to be liberally consulted concerning the technical points which can be mentioned in the advertisements to advantage, and his relation to this part of the office is not cancelled. As the orders come in, dealers may want to modify the organization of the goods offered to the trade, and it will be necessary to consult the judgment of the superintendent with reference to the acceptance or rejection of the orders. He may be able to suggest some changes in what is ordered that would lead a dealer to finally adjust his order to the advantage or disadvantage of the plant. Thus, business can, at times, be retained or gained that makes it more profitable for the plant. Right at this point it is of the utmost importance to teach the coming head that he should take a deep interest in the order department and follow up its details closely. He will be popular and successful very much in proportion to his energy and interest in making the order department prolific. He can do this by following up the order books watchfully, and filling them promptly. If for any reason there comes delay in shipping, he should foresee this so far as practicable, and soon as discovered, hasten to explain and advise all concerned. In this way he very likely elicits the sympathy of all interested parties and avoids kicks later.

Sales

Having a first-class plant with a capable organization, and a reputation for producing best selling qualities, it goes without saying that the mills under this management will be flooded with orders.

As the prosperity and progress of the plant depends entirely upon a liberal demand for its goods, it is of the utmost importance that accepted orders be properly filled, packed and shipped with swiftest dispatch known to the trade. All orders should be entered in a book, leaving room for entering shipments on account, and the whole indexed so that any order can be found instantly.

The Order department may also be called the Sales department. One includes the other, excepting that goods ordered may not always be sold. Some orders may be cancelled, or goods may be returned because not made according to sample.

Goods ordered and manufactured does not always mean sales. The prospective superintendent should bear this prominently in mind. If goods do not tally with specifications, or even slight delays occur, the orders may be countermanded. His ability must dominate this department and keep it clear of his faults. Another strong recommendation for the superintendent is to study his close relation to this department—the matter of selling prices. He must study his prerogatives in this respect. If prices are in keeping with the demand of a high grade of goods he can afford to make them. But if the house is selling below cost or so low below that a leak is the dam strains the margin of profit, he must call a halt and state the case in concrete form without losing his head.

Manufacturing

The superintendent will keep in closest touch with the order and sales department, follow up the organization of the goods, assign each order to the mill or department best adapted to fill it, provide samples, with instructions complete in writing, and by his system of daily reports as shown

herewith, he will know just how the plant stands from day to day as regards qualities, quantities and the economy maintained throughout the entire system of mills under his charge.

The pigeon holes or books relating to the manufacturing, in the office, are a record of process, organization of goods, together with productive capacities, samples, estimated costs, etc. This section will make heavy demands on the superintendent's note-book. He should be alert to note data complete with reference to all goods made and file them in this department with samples. He should also be familiar with the index of these files, so as to lose no time in reaching the information wanted rapidly.

Dye-house, Bleachery, and Designing

As this department is a very costly one to the colored goods plant, a careful account of all dye stuffs, with data complete concerning styles, designs, formulas, samples, costs, etc., is invaluable to the management.

These particulars should be arranged in sample book forms accompanied by data in full concerning organization of each sample.

Shipping

If the superintendent follows up the daily shipment invoices, he will discover frequently errors that he can set right before mailing. Shipping directions are often misstated. It is as important to be explicit in giving all particulars on the invoice sheets as when purchasing goods.

The office should maintain a book for entering all shipments complete, how shipped, and marks, etc. The invoice clerk of the packing department will make out his invoices in triplicate. One to be retained on file, one to follow the goods and one for the main office of the plant. Too much emphasis cannot be placed upon the value of properly packing the goods for shipment.

Exchange

Under this head comes the bills receivable and bills payable. Considering that there are always some customers who are slow payers, it is well for the manufacturing agent to know who they are on the list, and not pile too much goods on their account. Of bills payable it is well to watch the expense accounts and govern his purchases prudently and keep the outgoing sums as small as possible. In paying bills the latest method is to retain the original bill and only send a copy of the bill with the check. Having the original bill on file for reference precludes the possibility of its being lost in the mails. It also prevents the payee from holding the original form of the transaction. To hold the original bill on file by the purchaser is valuable data when desiring to repeat a purchase or for possible legal evidence.

The well-governed office never lapses. Bills payable are promptly paid, and bills receivable are promptly presented. The card system of "following up" these matters preclude the possibility of overlooking bills needing settlement. In paying bills payable the best method is not to send the original bill with the check. Only send a copy of the bill and retain the original for permanent reference. The reason for so doing is that in case the original bill becomes lost in the mails, the office would still have complete data on which to cover payment. And if the payee did not return receipted bill the original form of the transaction would be lost to the office. This data is often valuable to an office desiring to repeat a similar transaction, or for possible legal evidence.

Stock Account

The stock account book, unless it contains figures that tell anywhere near the truth, is a source of great perplexity to the management. The stock takers should be trained to do their work with great faithfulness. It is unwise to over or under-estimate. So far as practicable the actual amounts should be ascertained. When not practicable to get at actual amounts, a good judge can strike an average that will be within reasonable limit. The time to take stock is not on

a holiday or at any time when a man is likely to hasten unduly so as to get away. The best time to take stock as accurately as practicable is to assign a time that the men would be at their regular work if they were not stock-taking.

As the circulating stock, in a well-balanced mill, is much the same from time to time, if a perpetual stock sheet is kept as should be, an instantaneous stock taking can be taken daily, and the periodical stock taking will serve to prove the work and correct errors.

There are four phases of this to record and explain: First, the raw stock on hand; second, the stock in process; third, the finished goods in stock; fourth, the value of each. The need of accurate figures on these four phases of the stock account will command more than ordinary attention. The superintendent needs to audit the account of all stock on hand and satisfy himself that it is faithfully checked off and proved. If he does not do this mistakes are sure to involve the management in false balances. The value of the finished goods is based upon the market price at the time of stock taking. The market gain or loss should not be mixed with local profits. The stock in process is quite a complicated matter, and yet the trained mill man has no difficulty in getting at fairly close figures. Actual amounts should be ascertained so far as practicable and otherwise; lumps should be estimated with impartial judgment. It is best not to have the men take account of stock on a holiday, because on such occasions they are apt to hasten unduly and arrive at inaccurate results. Having taken the stock in process, the superintendent will need to follow up same into the office, and see that proper values are placed upon each group as the stock advances toward finished goods. The office clerks, in their haste to finish their reports, are apt to smother differences and show the mill to be on a different basis from that on which it really is. A simple illustration will initiate the reader into the proper method.

If cotton is worth 10 cents per pound and the stock shrinks 10 per cent. in passing through the carding department, all the stock in process in that department is worth 10

per cent. more than the price of raw cotton. This will include all finished rovings that is in the spinning department. This stock would now be worth 11 cents per pound. To this add one-half cost of carding for all unfinished stock in carding room. Assuming that the cost of carding is .60 cents, the card room unfinished stock would be worth 11.30 cents per pound. The finished card room stock in carding and spinning rooms would be worth 11.60, plus one-third of the general cost per pound. Estimating the general cost to be 75 cents per pound, would make 11.55 cents for the unfinished carded stock and 11.85 cents for the finished carded stock. All yarns in the spinning room would be worth 11.85 cents, plus cost of spinning, plus one-third of the general cost, plus three per cent. for shrinkage. Finished cloth would be worth one to two per cent. more, according to shrinkage, plus cost of weaving and finishing and one-third of the general cost. Add to this a reasonably estimated profit and the status is then fairly known. If the new superintendent is not familiar with these figures and does not follow up the accounting end of this, he does not know whether he is being given credit for the exact state of things. As cost of goods is made on the basis of periodical stock taking it is of the gravest necessity to get at the true state of things.

Profit and Loss

This department is of no small moment to the manufacturing head. He is operating his mills for the profit side of the ledger, and if his record shows up on the loss side he is sure to run against some grievances which need to be remedied, whether the loss is incurred in his special movements or caused by market fluctations. In either case he must bear his full share of the burden. It is, of course, important that the manufacturing head knows which way the wind blows in this matter. The chief reason why he should not be kept guessing as to which side of the ledger his balances drop is that he is sort of an investor of the company's funds into the plant. He figures same as the capitalist does, viz: that the more he invests of the company's money into the

plant, the larger returns he can turn over to his treasurer. To illustrate this point well, we will suppose that the mill is on a paying basis and that the superintendent is posted on the department in question. He sees a chance to put another responsible man at work in the mill, and that in order to make this move he must spend, say $2,000 more this year, but that the expenditure will return good dividends. He knows the mill can carry the load and so he takes the step. But suppose the mill is carrying heavy losses, it might not be able to carry the extra load even though it would prove a paying investment; but if the mill cannot invest it, it might prove the last straw to break the camel's back. Therefore, the superintendent must not, through his ignorance, make a move without getting into touch with this department first.

Tenements, Farming, Provision Store, and the Yard

Many cotton mills have tenements, and it is the pride of the officials to maintain, so far as possible, a model village for their employees. The houses are in charge of a carpenter who keeps them in excellent repair and supervises the premises. He keeps in close touch with the office and provides the clerk who keeps the tenement books with data in full concerning the actual condition of the property. The clerk will not only keep a record of rents collected, but will make notes of what repairs have been done and the date. Cases of sickness, distress, etc., are all kept on record in the tenement book.

Many mills not only own tenements, but have vast areas of real estate, and in several places the company maintains a farm. In this case a farming account is kept, which relates what crops are raised, quantities, costs, etc. The farm is placed in charge of a practical farmer who gives a careful account of his stewardship. Potatoes and such things that are raised are sold at the mill store. The hay that is grown is to feed the horses of which a large company will have several pairs to do local trucking from mill to mill, and to and from the railroad. The modern mill, however, is approaching the time when all trucking by horses will be

a thing of the past. Most of it will be done by the overhead single rail system. The yard trucking accounts are kept separate from the farming account.

Many mills that maintain the factory village system, also have a "factory store," so called, where household goods complete can be purchased at slightly reduced rates. This department will be managed by a competent storekeeper. The main office of the mill provides a clerk to keep the books who is responsible to the chief accountant. The purchasing is done by the regular mill agent or buyer. While many mills own and operate these departments, and economic questions arise therewith, it is sufficeint to add that each department is treated separately on the books.

The yard is an expense proposition purely, while the former three departments are revenue bearing propositions. The records show the expense account of each and the earning capacities separately.

Welfare Work

Next to the tenement department of the office comes a valuable side line, which at the present time is commencing to be recognized as an indispensable department to a large plant. Under the management of a careful work manager, the superintendent can accomplish much better results. As this service affects every hand in his mills, he is directly interested in the success of this branch of the business and should cultivate its acquaintance. It makes a vast difference to him whether his help are well housed, have good sanitary arrangements, schools, churches, entertainments, and all that goes toward making the help cheerful and ambitious. Many a good superintendent could accomplish greater results with a welfare department, and others have failed for want of good help, which could not be secured because the conditions were too far from being attractive in the way of modern conveniences.

Engineering

The modern mill office nowadays gives a liberal corner to the engineering operations. In times past not much attention was paid by a superintendent to the engineering problems. In these modern times the new superintendent is expected not to waste coal dust, nor to allow smoke to curl above the top of the smoke-stack. He will be invited to air his views as to how many (?) horse power he can obtain from a pound of coal, and called upon to exercise his dimensions on the subject of power. And the mathematical problems in connection therewith are so complicated that the rising man needs to approach beyond the portals of this department and study its possibilities; not, of course, with the idea of becoming a skilled fireman or engineer, but to know its essentials and not be a total stranger in its branches. The cost of steam and power is a matter of great moment in all steam operated plants, and many superintendents have more than saved their annual salaries by their intelligent knowledge of power economics. The office records of this department show not only the economic efficiencies of the power plant, but included in the records are the plans, specifications, quotations, together with data completely indicating where are hydrants, stand-pipes, valves, boundary lines, waterways, etc. For want of such a system valuable time has been wasted probing around to locate things. This department is also rendered the more valuable when a list of patterns is kept, condition of machinery and buildings. These matters are brought before the house by the superintendent and filed in the engineering department of the office. The wide-awake superintendent will find it of great advantage to inspect the charts of this valuable section, and keep himself alive to the needs of his domains. Akin to this department is the diary and statistical department. The former is eventful, the latter is the book of averages. The general expenses, bank account, auditing and secert service should be as well looked after by the treasurer, that no intervention be required from the manufacturing head.

The records of this department include plans, specifications, quotations, costs of buildings, complete data indicating where hydrants, stand pipes, valves, boundary lines, water rights, etc., are located. Charts, drawings and maps, etc., are all properly filed, and the card index employed to instantly locate everything connected therewith. For the want of such a system much valuable time and money has been lost in probing around to locate things.

List of patterns, with all machinery specifications should also become recorded. This can be carried along to include speeds, horse power, etc., and rendered as valuable as desired. Condition of buildings, and machinery in general, what needs immediate repairing, should also be kept before the house in the form of weekly reports therefrom.

General Expenses

Under this head comes the salary list of officials and all other expenses, such as repairs, supplies, belt and roll shop, yard and watch, power, fuel, freight, lights, water, taxes, insurance, incidentals and other unclassified expenses called sundry expenses, which are not imputed to the labor cost sheets. A ledger is kept for this purpose, and is in charge of a confidential clerk.

Earning Capacity

This is now the only province of the office which needs to be considered in this paper. As this province affects the manager and his work more seriously than any other, he needs to study well its principles. To be expert he should know what is the maximum capacity of his plant, and his constant aim should be to realize 100 per cent. of the earning capacity of his mill. Very few men are able to reach the full estimate, but keep their percentages as high as they can. The nearer they approach the top round, the less criticism is brought to bear on their management. These men, to hold up their end well with the office, must know how to figure and prove the clerical work to his satisfaction. If the office work is not correct, they must be competent to point out

the discrepancy and advise how to straighten out the same and preserve good feeling. To illustrate, we use an example. Here is a mill making a line of goods using nominally 28s and 36s yarn. The output of No. 28 is 50,000 pounds per week, and of No. 36 is 40,000 per week, and actual size of the yarns mentioned are respectively: 29.50 and 39.00, which makes the average yarns to equal No. 33.72. On this average the mill is producing 90,000 pounds, but the standard production is 94,500 pounds per week, showing a loss of 5 per cent. in the efficiency of the plant, and is a fairly good showing. The above figures would represent the true state of the mill efficiency. Now we will suppose that the different reports reach the office, and that the clerk proceeds to record the status of the mill from the nominal yarns, instead of the actual averages, which the writer has known to occur. His figures would show a loss of 10 per cent, instead of an actual loss of 5 per cent. Because he finds that No. 28 yarn with 50,000 pounds and No. 36 yarn with 40,000 pounds, equals an average of 31.56, and at this number, the mill should produce 99,000 pounds, and this would show a loss of 10 per cent. This means that, at a profit of 3 cents per pound the mill would be losing the sum of $270.00, being what the loss of 9,000 pounds of yarn would come to at a profit of 3 cents per pound.

It therefore occurs to the thoughtful reader, that in figuring up the earning capacity of a plant, it is well to see that the office uses the actual, rather than the theoretical number of yarns, for the basis in making up the books. There is another very interesting point to consider in connection with the earning capacity of a mill. Carrying forward the above example, we find that if the 90,000 pounds of goods is sold at a profit of 3 cents per pound over all costs, the mill earns $2,700.00 per week. If it costs 5½ cents per pound, all expenses included, then the cost rounds up a sum of $4,950.00 per week. Now if the standard production is 94,500 pounds, and that amount is secured for the same money outlay that it took for the 90,000 pounds, there is a two-fold profit on the additional production. That is, the

cost of the extra 4,500 pounds would be nothing, or there would be a cost of 5 per cent. less on the entire lot of 94,500 pounds. At any rate, the mill would not only gain a profit of 3 cents per pound on the 4,500 pounds, but an additional profit of 5 per cent. reduced cost on the production of the mill, which would amount to about $380.00 per week. This shows that a superintendent who can figure realizes more keenly the fitness of things, and that it pays to get off the largest amount of the full production that is possible. If a mill is earning $2,700 per week under ordinary management, but which by extra good management can be made to earn over $3.000.00 per week, the effort is worth making. At $2,700.00 per week profit, this represents 4.68 per cent. on a plant worth $3,000,000. But if an energetic man can make this same mill earn $3,080.00 per week, it raises the dividend rate to 5.34 per cent. The overseer in becoming the new superintendent must endeavor to be the full production man, or stay where he is, and let the old superintendent run the mill until he can show better results.

Bank Account

Of course the bank account is carefully guarded by the treasurer. It serves as a clearing house, and the usual methods are so familiar to most men that it is unnecessary to go into details in this work.

Auditing

This branch of the work, although connected with the business, is not controlled by the chief accountant. There should be auditors. One appointed by the directors to go over the books semi-annually. Another is appointed by the treasurer to audit the office books quarterly. One proceeds, as the directors desire and the other works along the line of the treasurer's direction, and the two work independently of each other, and together they protect the interests of the company. One is a check on the other. When an auditor arrives he takes full charge of the office, and safe vaults; private drawers are all turned over to him, and every office

hand from the chief accountant down must do his bidding and give him the right-of-way.

Secret Service

This department, often resorted to, is to ferret out tangles and prove suspicious characters. There might be several secret service workers in the mill at one time and no one suspect their presence. They perform service for the directors, treasurer, superintendent, accountant, and it can be carried on indefinitely. The value of this service in some cases is obvious to the business man.

Statistical, and Diary

All books having been balanced, and audited, now enter upon a permanent record for future reference.

A journal of statistics can now be opened and kept that may reduce researches to a minimum. Such questions as: "What did our cloth cost five years ago? What is it costing us to spool our yarn? When was it that the water ran four feet over the dam?" All the questions are promptly accessible in the statistical book where all periodical averages are compiled and tabulated in proper order.

In connection with this department a diary book is kept. The importance of keeping a diary of chief events, in the mill office, is of more importance than is usually appreciated. It answers many tangled questions and is of much aid in legal proceedings. Such questions as these are answered: "When did the engine break down in Number 1 mill?" "When and why did the weavers strike in 1902?" These answers can contain data complete concerning each event. It often happens that the treasurer wants such information speedily, and the bright accountant can, by prudent foresight, satisfy the most fastidious.

To the uninitiated this system may seem very complicated, and it may seem complicated even to the mill office making no pretension at keeping a fine system of accounting. However, upon examining closely, it will be found much less complicated than the confusion which arises from a dis-

orderly kept office. About the same information must be ascertained in either case concerning all the departments, and in the one case a system of order is kept up and indexed which makes research and summary work vastly easier. In the other case, where order is not followed, a tangled mass of accounts must be unravelled to find valuable information, and the cost of the better system is more than off-set by being able to get more accurate costs to make sale prices, less time is spent in researches, much saving of correspondence, less waiting and mistakes in the supply department, and, on the whole, the corporation enjoys an unexcelled reputation for making goods under the most economical basis, and of which the market is never overstocked. A well managed accounting office is to the corporation as the rising of the sun is to the globe—both spread their radiance upon the markets of the world.

Economy in the Office

While many managers of cotton mills are severely exacting in regard to curtailing unnecessary expenses in the manufacturing processes, it is appalling to observe the needless cost with which the routine work of many accounting rooms is carried forth. Speed and automatic machinery are as important here as in any other department of a manufactory. Yet it is often noticed by those well qualified to judge, that a vast amount of hard work, such as adding and listing, is done by head and hand, instead of employing modern methods of accomplishing them. And because the methods are not improved, thousands of small offices and as many large accounting rooms employ from one or two to scores of tired clerks doing work by head and hand that could be dispensed with. This vast army of extra office workers are retained from year to year at a tremendous drain on the profits of the plant. The remedy is to use labor-saving machinery in the office as elsewhere.

There are many other problems incidental to the study of costs and earning power which need not be discussed here. There are special books on this subject and the new superin-

tendent should look them up. The writer has only endeavored to briefly outline principles, and show up the more important aspects of men and their relation to the office end of the business. If everything is all right the corporation will enjoy an unexcelled reputation for making goods under the most economical basis, and of which the market is never overstocked. A well managed accounting office is to the corporation as the rising of the sun is to the globe—both spread their radiance upon the markets of the world.

Cost Finding

The cost finding department is the most important and delicate work of the office. This work should be assigned to a clerk who can figure very closely, and is deeply interested in the art of finding the exact cost of each kind of goods.

To find the average cost in an ordinary mill where only one line of goods, or several kinds that are similar in character are made, the accompanying style of cost sheet answers the purpose completely. The value of this style of cost sheet is two-fold. The upper half of it is devoted to the cost of each department which is based upon their individual production. This places a premium upon departmental effort. That is, if a department can keep ahead of the succeeding department it is not fair to hamper its progress and base the costs on the basis of finished goods. For example, the spinning department might secure a week's production of 50,000 pounds, while the weaving department might secure only 40,000 pounds of cloth. If this condition is permanent yarn could be sold or more looms added to advantage.

The second portion of the report is devoted to the cost of the finished goods entirely and gives the average cost only. For a plain goods cotton mill making only one kind of cloth this report will answer the true purpose of cost finding. But with the addition of several lines of plain goods, or with the fancy goods mill, the exact cost finding becomes exceedingly delicate and complicated, and must be computed otherwise.

Cost of Manufacturing

Mill No..... Date.....

Departmental Cost.	Production per Dept., lbs.	Labor Cost per lb.	Supplies per lb.	Oils per lb.	Repairs per lb.	T't'l Cost per lb.
Carding	10,000					
Mule sp'g.....	4,000					
Frame sp'g.....	4,500					
Spooling	4,400					
Twisting	300					
Warping	4,000					
Bleachery	1,000					
Dye House	6,000					
Beaming	5,000					
Slashing	5,000					
Drawing In.....	5,000					
Weaving	7,000					
Cloth Room.....	9,000					
Cost of Finished Cloth.						
Carding	9,000					
Mule sp'g	"					
Spooling	"					
Frame sp'g.....	"					
Twisting	"					
Warping	"					
Bleachery	"					
Dye House	"					
Beaming	"					
Slashing	"					
Drawing In....	"					
Weaving	"					
Cloth Room	"					
Belt & Roll shop,	"					
Yard & Watch ..	"					
Repair Shop.....	"					
Power	"					
Fuel	"					
Freight, etc.....	"					
Light	"					
Water	"					
Taxes	"					
Insurance	"					
Salaries	"					
Incidentals	"					
Interest	"					
Depreciation, ..	"					
Unclassified exps.	"					

MODERN MOVEMENTS THAT REDUCE COST

The active superintendent of a plant is always on the everlasting hunt to see what he can do to reduce the costs without sacrificing quality and production.

There are many ways in which he accomplishes this. He often finds that a bright, smart clerk can put more time on his job and do one-half again as much work, and that it is only necessary to give him a little more money than he now gets to have him do the work which formerly took two clerks. He learns, too, that this same principle applies to some machine workers.

Sometimes he finds that the machine can get off more goods by taking the speed off, or by speeding it a little more; and thus he reduces his cost, especially if the work is done by day hands. But even if the work is done by piece price, he increases the output of his factory and thus reduces the cost of production over the fixed charges and salaries.

Again, he often finds that a machine can be made longer, pieced out, or that it can be enlarged otherwise and still not call for more attendance than the one operator previously gave it.

He also finds that some capable overseers are capable of supervising one or more departments in addition to their present charges. Therefore, he promotes a bright man by giving him additional work, paying him some additional pay. He makes a man that much happier, blesses a home with greater prosperity, and has made a stroke of profit for the company. These are mighty good moves and make money for his firm to everybody's good; for he does not always discharge the person whose work was taken from him, but closes these deals at times when people leave, etc., or at any rate he makes it as comfortable for all concerned as possible. Sometimes he makes a whole series of such promotions until it dwindles down to the dismissal of a few unimportant hands.

His other movements in the line of applying some more modern improvement to some of the machinery from time to

time, brings about large savings in the aggregate. Sometimes the putting on of a stop-motion will work to such an advantage that a person may be enabled to operate from one to several more machines. at very little extra cost per hand.

A careful analysis of the processes sometimes brings about the fact that some goods are made just as good, if a certain process is dispensed with entirely. In fact, in some factories it has often been discovered that a line of goods has been much improved on account of being given less processes. Less handling weakens the goods less.

The matter of trafficing in a factory is of vast experience. Both the traffic of the goods from process to process, and the employes themselves from place to place, is of great expense. A new door cut through a certain wall which shortens the length of a certain alley or passage-way, enabling the help and the goods to reach their destination more directly and that much sooner, counts up into dollars. This is of vast importance where there is much movement of goods in a certain direction. Some men have reduced the cost a good deal by putting in more faucets for drinking water, and additional sanitary conveniences, so that the help could remain more at their work. The same can be said about the conveniently arranged supply of the goods in their successive movement from process to process, so that hands can help themselves rapidly.

Lastly, so far as possible, it is of vast saving to any plant to have automatic conveyors for everything that it is possible to thus move without a man's attention. Many shops, factories and mills are now devoting much attention to all these cost-reducing problems. And the man of the hour is the man who drives at these labor-saving devices and cost-reducing stunts. He is the coming man. The whole world is looking for this man, and the compensation is *his own* price for his services. He is always worth more than any salary that is available. And any plant that can secure him is very fortunate, for he is a valuable asset. Welfare work in all of its modern phases is also today becoming more and more a fostered institution. Anything that tends to make the

help healthier and more contented is a revenue-bearing undertaking every time.

Keep the factory wheel well lubricated with all these good things, and bag the profits. Many superintendents have made themselves famous by these methods.

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*THE MODEL SUPERINTENDENT

The duties and work of a cotton mill superintendent call forth all the virtues that a man can cultivate. His duties cover a vast deal of territory. He deals with all kinds of characters; comes into touch with multitudinous details; and is the everlasting power behind the throne upon which lean all the subordinate heads for counsel and direction. In other words, he is the whole push, and the constituency of the plant, as it were.

To be a competent cotton mill superintendent, a man must not only thoroughly understand the processes through which the cotton must pass to be manufactured into the goods required, he must be a good judge of human nature and be a good manager for help. He should have a fertile brain; a retentive memory; broad views, good command of language, be an excellent logician and have best of business training to govern the extensive force of skilled workers and dictate the course events should take to command popular approval, and bring revenue to his firm that is commensurate to the capital invested.

While the above mentioned qualities are invaluable to the successful manager and his mills, there is another field in which his superiority should be entirely at home. In no office are figures required to produce such fine, long and well drawn-out results as in a superintendent's office. His success depends largely upon being a good mill mathematician, and being quick and accurate at figures. For him to be able to solve the speeds and possible production of the various machines is a prime requisite in locating leakages and exces-

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sive costs, improving methods so that needless expenses may be curtailed, and be able to maintain full production and superior selling qualities in his line of goods. To accomplish all this satisfactorily, he must know how to exercise his power of influence to organize his various departments on a fruit-bearing basis that will insure the largest margin of profits.

As it requires continual following up of these matters of production, qualities, wastes, costs, etc., he is obliged to have a system of daily reports from each department. These reports, although concise, should be carefully drawn up so as to show at a glance just what each branch of the plant is accomplishing daily. They ought not to be elaborate as it would complicate matters, taking too much of the departmental overseer's time to fill out, also too extensive for the superintendent to pursue.

The system which works best is for the superintendent to arrange, in his private office, a file for each department in their respective order. The form of reports best adapted are those of uniform size and which can be arranged in common for each department. The heading should read so that same can be filled out for the day, week or month ending. In this way the daily reports can be taken up and averaged for one week or month or for any period of time, as desired. The most important particulars wanted on these reports might be summarized briefly as follows:

Number of hands out.....
Machines stopped .....
Average size of goods.....
Goods finished .....
Second rate goods.....
Per cent. of possible production.....
Goods shipped .....
Stock on hand.....
Labor costs .....
Wastes .....
Supplies received .....
Remarks .....

The form or style and character of these reports can be varied to suit each department, and any information called

for that the superintendent desires to obtain and have daily at hand. Of course his prudence will not permit to overburden the departmental heads who in turn have to gather data from many sources, and these overseers must have ample time to manage their help.

The superintendent in making his tours of inspection, which should be as frequent daily as practicable, will not trust to his memory for carrying details to his office for future consideration. He will make notes freely. In giving orders of heavy importance he should present same in writing, also ascertain if the recipient correctly interprets its diction in full, as intended. In this way much misunderstanding is avoided and costly failures to produce timely results are retired.

To this help he will be impartial, take deep interest in their welfare, and inspire them through many channels of assistance to be fully efficient—giving their best service every day. In the community he will lend his influence to every agency that may uplift humanity and inspire them to a fuller realization of the Creator's ideals.

The superintendent will also keep in very close touch with the representative of his company. If his mills are large he may be responsible to a resident agent. If they are small he may be filling both positions under his title and be responsible to a non-resident representative who is usually the treasurer, but sometimes the president or managing director. In any event, unless he is proprietor, he must either directly or indirectly be responsible to his company. Hence it will become him to keep them well posted as to the conditions of his mills, guard their interests with strictest integrity, and be obedient to their governing policy. When appearing before them to either make reports or seek counsel he will have much for which to answer. Here, again, he must be apt and ready. He should have his memoranda carefully arranged beforehand, have his subjects and subdivisions indexed so that he can put his finger on the point under consideration instantly. In taking his orders, he must be equally cautious to have his notes clearly fixed in

his mind; for upon the proper execution of these orders depend, in the meantime, the success of his mills and his own reputation. He must produce the goods required to grow in favor with his superiors.

The superintendent who thus conducts himself will be eminently successful. The help will admire and follow him, and the company will find him so invaluable that unswerving confidence will be reposed in his capacity and sterling qualities.

The question as to what salary a man of this experience, stamp and calibre can command is usually in proportion to the size of the plant of which he is called upon to take charge, and in many cases the matter of salary is arbitrary. Some of the small mills have men with whom they would not part at any cost of salary, and will pay even more than many large mills. In this case the directors believe in staking their success upon the man who is making them a fair profit rather than to risk their chances with a new man who would work for much less. While the large mills usually pay the larger salaries, there are many paying much less than the very small plants. The salary list of superintendents, agents, managers, etc., ranges from $2,000 to $30,000 per annum. And a hustling good superintendent who takes a strong interest and very deep pride in devoting his entire time to promoting his company's welfare is worth many times any salary that may be paid him. This kind of a man is the most valuable asset that a corporation can have; for the most lavishly endowed plant is useless so far as returns are concerned without a man who can produce paying results from same. The man who has the ability to produce results is as likely to fare as well with some small plants as with large ones.

THE IDEAL FIXER

Textile machinery is made up of so many small parts and counter parts, and their relationships are so peculiarly dependent one upon the other, and their relative adjustments require such close setting that good fixers are in great demand. They are like oil on the troubled waters.

To commence our story, it is only fair to state that an ideal fixer must be of a mechanical turn of mind. Simply to know how to run the machine does not imply being a good fixer. But a good fixer should know how to run the machine. He is like the good physician who can cure the sick. The fixer's work is like the different medicines. Each has its place and when properly applied removes the evils.

To name some of the specially good qualities of the ideal fixer, we would say he knows his trade, keeps his machinery in good running order without losing valuable time, and is economical. In other words, like the good rule of proportion, he has three well defined terms in his make-up: He knows how to fix his machines; is quick at his work; and never wasteful. When it is remembered that the officials make the smallest margin of allowance for stoppages, when figuring the possible production of machines,—it is necessary that the ideal fixer have these qualities well established in his character. For the fixer is between two fires; and his critics are numerous and severe. Above him are many of the leading officials who have had their turn with the hammer and monkey wrench, and they know when good work has been done without seeing much of the man at the bench. Most of these officials above him—the second hands, overseers, superintendents and mangaers, have reached the front ranks by virtue of their excellent fixing.

Below the fixer are the help, who are none the less severe. Most of them are piece-workers, and the running time of their machines is their bread and butter. Woe to the fixer who is not a hustling, quick, genial son of the right metal.

Behind all these good qualities, the ideal fixer must have good tools, and like the man with a system, he must know

where they are so as to have them when needed. On his person he should carry a small screw-driver, caliper rule, pocket level, jack-knife, pencil, small adjustable wrench, pliers, and whatever else, in a small way, that is adapted to his section. The heavier tools he will have orderly packed in a small hand box. The idea of all this convenience is to be prepared to fix many trifling disorders without going to the bench for every tool needed. In applying his force when putting parts of machines together he is very careful to make perfect fits and not drive things together so hard that when the time arrives to take machines apart, valuable time is lost, and excessive breakages ensue.

When several parts are being taken down requiring re-assembling, he marks all parts relatively and avoids all possible confusion in re-setting the machine. He is efficient with his note book.

The ideal fixer is resourceful. He never gets stuck. He has some way of getting onto his feet in the quickest possible time when thrown down by several breaks at one time. This kind of a fixer has few drawbacks, because he has the complete sympathy of the help and the officials. They all want the belts on the tight pulleys, and are on his side. He will be very popular, and is destined to rise when his turn duly approaches.

PROGRESS AND PROFIT FOR MILL MEN

The true virtue of mill management is to obtain the largest per cent. of the possible output or the plant or the maximum production, of the right quality wanted, at the lowest cost of manufacture, and still retain the working value of the plant up-to-date, so far as possible, until it becomes wise economy to rebuild or rehabilitate the plant with entirely modern machinery.

No matter how large or complicated the mill system may be, the manager is expected to cover this ground so well that he will be above criticism at all times. In order to accomplish this, the manager must be *larger* than the factory every

time. He must be so large that nothing is too simple for him to let go unnoticed that savors of harm, and nothing too large for him to grapple with if it should be accomplished for the interest of his firm. This is why some manufacturers succeed so well, while others plod along under heavy pressures if the manager is smaller than the factory.

The expert, economical manager knows a few things that are of inestimable value to the plant. He knows that he does know these things, and he starts with these principles well in hand, and follows them up all through the bone and sinnew of his plant. His chief principle is that the *best* of *everything* is the *cheapest*, and his next principle is that all these good things require first-class attention.

In the make-up of his plant, he lays down these prime requisites:

1st. Convenient location of mill.
2d. Properly proportioned buildings.
3d. Well constructed buildings.
4th. Best makes of modern machinery.
5th. Proper arrangement of the machinery.
6th. First class help.
7th. First class raw stock to be manufactured.
8th. First class supplies.
9th. Perfect government to keep all these changeable conditions at their best.

These are his foundation stones. Having located his plant at a point easy of access and with good shipping facilities, he seeks to maintain his mills and forces centralized and not introduce needless branches which always increase expenses. As his buildings are properly proportioned, and constructed of reliable materials, he does not depart from his early policy and spoil them later with barn-like additions here and there.

Of the machinery he takes good care of this; sees to it that it is properly speeded, oiled, cleaned and kept new by properly repairing from time to time, and by applying latest improvements to same when possible. He selects his help

as he would a timepiece and treats them the same; keeps them wound up and working.

He does not spoil his reputation nor that of the company by trying to make high-grade goods from inferior raw materials. He selects his supplies as cautiously as he does his meals, and never suffers his plant to have indigestion on account of introducing low grade supplies. He knows that cheap supplies, like poor meals, kill ambition and reflect on the goods.

Lastly, he is never slack in his management. He insists upon having the best government all through.

He has started with perfect conditions; supplied the best materials; instituted good discipline; and now he expects from the entire constituency faithful service, abundance of good work, and a permanent market for his invariably reliable goods. This enables him to pay good wages and secure the largest margins of profit at all times. Having all these advantages when he enters the market, he does not look cheap. He does not sell cheap goods and is not treated cheaply. This is the difference between the high grade, economical manager and the other manager who always deals with the "cheap" side of all questions. He is always cheap, and his cheapness permeates his plant and predominates in the markets. His goods are musty and he gets cheap prices and cheap profits, and his future prospects are always misty. And so there is a high-grade economy that pays highest profits against a low grade economy that buries the profits of all concerned.

Take your choice!

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*HOW TO KEEP SIZES OF YARN RIGHT

Keeping the different counts right in a cotton mill requires careful training and good judgment, coupled with the largest amount of willingness to work hard over details and prove figures beyond a doubt. The man who wants to keep

* Published in Fibre and Fabric.

his counts close to the die must be willing to work and not be bashful about asking his followers to weigh often and re-weigh until he knows positively that his numbers are at a certain definite point. The object of the close number keeper is to cast the die without undue variation, and not by averaging a wide range of variation. That is, if a yarn maker is asked to maintain his yarns at, say No. 28.60, and he gets this average from a variation of 26.50 to 29.50, he is far from being a good yarn maker. But if he secures this end by a slight variation of 50 points above or below his standard and maintains his goods within this range, it can be said that this man is doing some hard work himself and observing closely the varying conditions which upset the counts and meets these conditions squarely on their own ground.

On yarns as coarse as No. 12 the variations in counts should be, of course, much less than counts of No. 30's; at No. 12, a variation of .25 either way need not be exceeded. So that a maker of No. 12's yarn would secure his average from a range of 11.75 to 12.25. In fact, one of the ablest and best cotton manufacturers in New England uses a great deal of yarn approximating 12.75. He frequently finds it necessary to adjust his standard to meet varying requirements. For several months he may want his yarn to size on an average of 12.60. Thereafter he may want the standard changed to 12.70 for a period of three months. His assistants are such close followers that he never fails to get the average within one or two points of the standards set by him. This is what is classed as expert service at number keeping. On yarns finer than 30 the range of variation increases, but the minimum range of variation must be jealously guarded.

Now, the questions arise, what is the best way to size or weigh the parcels; how often to weigh them, and where to begin to keep the numbers? These are pertinent questions. The answers to these questions are simple enough. The student learns them easily, but many of them do not like the hard work attending it, and lose the training and power to

carry out the standards. There are many older heads who can answer these questions, but owing to the fact that some of them draw the line at the work-side of the case, giving careless attention to details, is the reason why they are poor hands at keeping numbers. The one great answer which covers the ground well is work. How to do this work is the object of this paper. The proper place to begin to keep numbers is in the picker room. Mix the cotton very well, even if one grade of cotton is used alone, it does not follow that at times the picker can be fed with one or a few bales from the same lot at a time. For even in the same lot of cotton there are widely different bales. And even in a single bale of cotton there may be found great variation of color, staple and quality. Hence it follows that it is best to mix a convenient but large number of bales, whether of one high grade lot of cotton or of varying lots. In using several grades made up of long and short fibres, tinges and quality, extreme care must be given to maintain the same degree of mixings from week to week. That is, as each lot runs out, to replace it with as similar a lot as possible. To secure the best modern openings is to have a bale breaker which is arranged to carry the opened cotton to any part of the space holding the opened goods. In this way cotton can be opened in one spot while it is being used from another plot. The pile which is being built up and left to stand for some hours, while not being drawn from, is becoming well aired or acclimated to local air and is less susceptible to opposing or counteracting forces. If it is dryer than the local atmosphere it will gain the difference, and vice versa. Then the temperature adjusts itself. When cotton is rushed through before these adjustments are naturally brought on, the attendants must cross swords with electricity. This causes uneven delivery, and is one of the sources of split laps. Another evil is that of clogging the machines and causing break-downs. When mixings are thus conditioned, machines in good working order, properly oiled and speeded, the laps will be smooth, even, and vary only little. However, every lap from the final process should be weighed and tallied.

Laps varying more than one-half pound from the standard should be re-worked. The finished laps should be placed into three groups, viz: those that weigh "on the dot" in one group and those weighing immediately under or over the standard, but not varying over one-half pound, in the other two separate groups. The next thing to do is to see that the card tenders do not use the heavier laps faster than the lighter ones. This means close application to duty by all hands, but becomes easily understood when the system is established.

Next in order of importance are the railway heads or drawing frames. Many mills have discarded the use of railway heads, so-called. It has been proven that with equal attention to the former processes the numbers are as even without railway or self-evening drawing frame as with them. And unless the self-evening frame is well understood and properly taken care of, it will render the work more uneven than when not used. In years back, when carding departments were smaller and responsible help roved less the self-evening frame was closely observed and the sliver from same was weighed every two hours, the work was fairly even. They were regulated closely. The same man weighed the sliver from these machines year after year. And in those days an overseer and his assistant had little else to do but to watch his numbers. Speeds were low, and it was their chief aim and pride to excel in keeping their counts on the point. However, things have changed in recent years. Carding rooms are very large, speed is high, and the duties of overseers and their assistants have multiplied even faster; so that with a large number of self-regulating drawing frames, to look out for the weighing of same is perhaps done only twice a day and by a less responsible person, who may be changed as often as there are seasons, it can be seen that there is a vast opportunity to make more uneven work than without them.

The old style evening frame which starts to even with the variation of sliver in the trumpet at the front of the machine, is of no use for modern standards. The sooner they

are thrown out and a double system or triple system of drawing from process of five or six doublings is installed, the more perfect the counts will be, and a great improvement made.

But the writer still maintains that the modern self-evening drawing head that detects the unevenness at the back instead of the front and regulates so as to even the spot before leaving the drawing rolls, if given the attention it needs and the attendant thoroughly understands the machine, it will make even work, and takes the place of one process of regular drawing frames. But considering the poor chances of getting a good weigher, the writer prefers to even the work without them. Having the preliminary process cared for, as outlined, precludes the necessity of self-evening beyond the finisher lappers.

Having a first-class man at the finisher lappers in a small room, or a lapper room boss in a large mill who can be relied upon to see that laps are kept even and who turns in his reports daily into the office, will make good work. The picker room is the place to begin to work upon the count keeping.

It is important that the overseer of carding and even the superintendent weigh a lap or two when going their rounds to prove the efficiency of the service.

The next proof of the efficiency work in the picker room, is to weigh the stock from the drawing frames. Weighing a few yards from each of the finished drawing work twice each day is sufficient. The result should be carefully recorded and filed for reference and comparisons.

After this the last process of roving should be weighed twice daily. The morning samples should be sent to the spinning department to be immediately entered.

It is a good plan to weigh all the stock from the roving making machines often enough to satisfy that each respective machine is uniform with the similar process of other machines. And when this is done it is well to weigh the roving on the bobbin at three different sizes, viz: nearly empty, one-half full, and when full. This will prove posi-

tively as to whether the roving is given a uniform tension from start to finish. Roving that starts with moderate tension and becomes tight tensioned, or vice versa, is uneven; and, besides, is strained and weakened.

The overseer of carding should, when sending his sample roving to be made into yarn, also accompany same with a list of the weights and mark each roving what it weighs respectively.

The overseer of spinning will weigh the yarn made from this roving when the bobbins are one-third to one-half filled. As a rule, yarn from the empty bobbin is a bit lighter and the yarn from a full bobbin is a little heavier. Taking bobbins when one-half full gives averaged conditions.

The spinner will also take a random lot of bobbins and weigh at the same time. The result of these weighings should be recorded in triplicate, one to be sent to the overseer of carding and one to the superintendent's office, and the other kept on file. Besides giving the average of the counts it is well to also state the lightest and heaviest weighing in each trial and draw out the variation. The object of this is to bring out the points that count prominently before the vision, and promote interest and care to confine things to as near perfection as possible.

The use of the reel and scale is a matter of study. Warp bobbins should be unwound in same manner as when spooled. To draw the yarn from over the top of the bobbins is improper. Do not reel tôo fast. The reeling should be done slowly and firmly, so as to give the yarn a uniform tension. In reeling filling which must be pulled from over the top of the bobbins, a uniform tension can be secured by winding the ends around the thread guide wires twice.

In turning the reel do not depend entirely on the mental or oral counting of the revolutions. Check the counting by the signal from the gong and that makes the count doubly sure.

Weighing on grain scales is another case for study. The scales should always be balanced before using. A bit of lint or small particle of dust may make a differenec of sev-

eral grains and upset the best intentions. It is a well-known fact that sensitive as grain scales are, a small skein of yarn can be balanced on the light or heavy side of its acutal weight. The proper way to weigh is to always keep the weight or counterpoise on the scale beam moving outward slowly until the tenths of a grain are known. It is unfair to give or take and call the weight on even or half grains. Do not borrow nor lend, find the tenth parts. To push the weight in on one skein and out on another does not give each skein a similar test. Therefore to weigh properly and to give each weighing a similar test, always bring the weight back so that the beam is up, and gradually push the counterpoise out until the beam falls to a balance. To weigh otherwise and expect close figures is as reasonable as to expect that a fox can walk a fence after his tail has been shot off. After having weighed each skein all variations will be shown. But the actual number should be proven by weighing all the skeins at one time. The quantity weighings should always govern the actual number and not the individual weighings. Just as the weighing of a section beam full of yarn, or the weighing of a cut of cloth or the total weighings of all the cloth made during a week, determines, after all, the actual counts, and that is what must govern the preceding standards of the smaller group weighings. Of course, if yarn is wanted a certain size in the cloth it must be remembered that it must be made heavier at the spinning frames to allow for stretching at the spoolers, warpers, slashers and in the looms. All the processes will shrink and reduce the size and bulk of yarns.

Lastly, never decide to make a change because one set of weighings show light or heavy. Several tests may prove that the yarn is just what is desired, one to four bobbins at each weighing, as done in many mills, is entirely wrong and insufficient to go by. Eight to sixteen bobbins to a set is none too many to determine which way the work is moving.

It must also be borne in mind that numbers that weigh one number heavy on a damp day and one number lighter than the standard on a cold, dry day or on a hot, dry day,

are all the same. The weather should be recorded with each weighing, and comparisons will soon determine what allowances to make for the weather and when the work is abnormally light or heavy.

To illustrate the point roughly, take No. 30 yarn as a standard. If this yarn sizes 29 for two days as a result of two days' dampness and later 31 because of excessive dryness, there has been no actual variation. It is all No. 30 yarn, and with the normal conditions these yarns would have weighed alike, barring actual variations. And with the return of normal weather these differences adjust themselves; the heavy work caused by dampness will dry out and weigh right, and the lighter work will regain its normal moisture. Hence it can be seen that to change the size of yarn or roving before there is any actual variation that is proved by repeated tests, is not the right method.

To sum up the business of kepeing numbers, the interested parties should be given daily reports of all section beam weighings. From these weighings the actual number of yarns can be correctly derived and the variations here should also be noted. Section beams that weigh about 400 pounds should not vary over three per cent., or from six pounds light to six pounds heavy. If the slasher tenders are careful to select the beams so as to average every set the same, and if the official and fixing personnel of the weave room is composed of first-class men who take care to keep the tensions and picks right at the looms, the cloth will show the minimum possible variation. The cloth room overseer should send a daily report showing average weight of cloth, together with the extreme variations.

Keeping numbers in a cotton mill is an easy task and a very interesting branch of the trade, when a man is willing to work and apply himself scientifically to his business.

TESTING STRENGTH OF YARNS

It would seem that testing the strength of yarns is a simple process, and yet there are valuable points in connection therewith which count for or against the same, as in every other branch of the trade.

A study of these points may be of interest to those who have hitherto paid no attention to them, and may aid others towards getting better average results when testing their yarns.

The first matter to have attention is the yarn testing machine itself. This machine must be plumb and all working parts should be clean, oiled and move freely. Next give the tester a proof test by suspending from the dial hook 100 pounds of any convenient material, say one or two cast-iron weights. If the pointer registers the weight correctly it is now in condition to test the yarn. Care should be taken that the dial pointer is at zero or starting point when the lever weight is hanging plumb. If the machine does not weigh correctly it can be regulated by raising or lowering the adjustable weight on the lever. There is a set screw at back of the weight for this purpose. When properly adjusted the lever should be marked to show where it belongs; so that only a glance shows as to whether it has been tampered with.

Having the yarn tester right, the next thing to do is to have the yarn right. The object of the testing is not only to detect weak work and how poor yarn is, but to see how good or how strong it can be made and to keep it up to standard by daily tests. Be sure that the processes are right and all parts in order that make up the yarn. Take no less than eight bobbins or skeins and reel off 80 threads of 120 yards, or if yarn is very coarse, as for example No. 5, take one-half or even one-quarter of this amount, *i. e.,* 40 or 20 threads. This should be reeled with firm, even tension, so that no slack rounds find their way into the skein. Should there be one or more slack rounds in the skein there will be no pull on them at the test, and the strain will be thrown onto and

borne by the remaining threads of the skein and thus reduce the average strength. Another important matter at the reel is to tie the two ends of the skein securely together and at as near the tension of the skein around reel as possible. This is more important than thought of by many who do this work. To illustrate: Take a skein of yarn that should break at 160 pounds, and suppose the two ends are not tied together; there is not only the loss of pull on these two insecured ends, but also a loss on the ends immediately adjoin them which are permitted to give and slip by. This evil may bring on a lower record of 5 per cent. in the strength.

Lastly, how to use the testing machine is as important to consider. Place the skein on the hook. Spread the threads out very evenly along on each hook to avoid one or more ends over-riding. An over-riding thread has to bear more strain and will impair the test. All being in readiness, commence to turn the crank at a smooth pace of about 125 revolutions per minute, care being taken not to slacken, or accelerate, or to turn by jerks. (To run same by a belt would be better.)

For want of attention to all these points it frequently occurs that good yarn gives a very poor test, and attempts to improve the yarn, of course, are futile. It can also be said that yarns not expected to be of superior strength show no record and causes sore heads. But if care is taken to test under right conditions, this same yarn will give a fair record.

Before closing these instructions it is well to advise in regard to comparative testing, thus: If No. 8 yarn breaks at a standard of 210 pounds, it is unfair to expect yarn to compare at this standard, that is to say, 8:25. The proportionate allowance must always be made for the exact size of yarn. Yarns made from wastes or above average stock will vary accordingly. Unnatural twisting will also affect the results. Thus filling will not break same as warp. Soft twisted yarns break at less pull than standard, as will over-twisted yarns.

*SUPERINTENDING THE MANUFACTURING

It is the cotton mill superintendent's business to take the raw cotton as brought to him in bales and manufacture same into the line of goods wanted and sold by his company. As a rule, he is a good judge of cotton, and renders valuable advice in selecting the staple best adapted for the goods desired. He does not purchase the cotton, and it is customary for the treasurer to attend to this as well as the financial matters of the company. The selling of the goods is usually done through commission houses, thus the superintendent does not sell the goods. He confines himself to the proper methods of manufacture, and to the economical operations of the plant.

At the manufacturing end he must take the raw cotton (which has already been ginned and baled) and clean, card, spin, weave and finish into the marketable goods of his firm. During all these operations, the economical end of the trade is the most important part of his enterprise. This means that the successful superintendent must not only know how to manufcture, but he must be enterprising enough to produce maximum quantity at minimum cost and maintain superior selling qualities. To accomplish these ends he must have the most skilled organized forces and most rapidly moving bodies known to science. There is no industry which calls forth so much energy, and demands such close attention as does the manufacturing of cotton goods. In no work is there brought to bear so varied and intricate combinations of elements and circumstances. Unless a man has a strong, fertile brain, a wealth of patience, vast capacity of details, is ambitious and blessed with untiring energy, he must never expect to reach the top round of the ladder in this business, which embraces these requisites and more.

The superintendent being a thorough, practical manufacturer, appreciates the value of having practical overseers under his care. With him it matters not whether the overseer is a textile school graduate or direct from the ranks with

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practical training. Everything else being equal one is as valuable as the other and they have an equal chance. The only difference is that the ambitious man from the ranks is trained and educated, the textile school graduate, unless he has previously served his time, is educated, but must afterwards be trained into the ranks, as they really are. Both must have had thorough experience at the trade as it is practiced before they can render efficient service. Virtually, there are no short cuts, and in either case the "goat" must be ridden. It is the work accomplished by the individual that tells in his favor. Eternal push is the price of his success, and by his fruits only can he advance.

Starting with the carding department, the overseer of which will be a well trained carder, we will now take up the processes in their successive order and take the interested reader through the mill and follow the raw cotton, observing the modus operandi to the finished goods.

Pickers, Openers or Lappers, so-called

The first process is the opening department, and the technical points of advantage to be considered here are of vital importance. Many superintendents have failed with their mills because of the inattention given to the picker room, or opening department. The first consideration is to get good average mixing of the cotton on hand. This is done by taking a proportionate number of bales from each lot. No less than one week's supply should be opened at one time, and this should stand a day or two before putting through the machines. Cotton to work well must be well broken open, either by hand or by a bale breaker, so that there will be no lumps or matted mass of cotton in the pile. The reason for letting it stand a day or more in the pile is to air it well, drying out any possible excessive moisture or vice versa, adding the normal moisture when same is excessively dry. This restores the equilibrium, giving the cotton a better working tenure.

The next thing to do is to beat the cotton in the machine and remove seeds, etc., without injuring the fiber. To pre-

vent injury to the stock, the beaters are not set too close to feed rolls. In an ordinary plain goods cotton mill, making prints, sheetings, drillings and the like, the staple or length of fiber is not likely to exceed one and one-eighth inches, and will average one inch to one and one-sixteenth inches. The first beater should not be set closer than one-fourth inch to feed rolls. If the stock averages one and one-sixteenth inches, set the first beater no closer than five-sixteenths inch to feed rolls. Another very fine point to consider is the edge of the beater blades. They should not have shear edges. The edges should be slightly rounded so that the stock is struck a forceful blow without cutting or bruising the fibers. Each successive beater can be set one-thirty-second inch to one-sixteenth inch closer than the preceding beater. The opener beaters should not revolve over 1,200 revolutions a minute. All other beaters not over 1,500 revolutions per minute. The speed of fans must be regulated to suit local conditions. While the above rules form a basis from which to start, experience alone can adapt these adjustments to give best local results. The successful superintendent makes a great deal of his opening department. He requires that closest observation be given to every detail. His machines must be perfectly level, lubricated, and scrupulously clean. The picker room gives its best results when the temperature is not allowed to become chilled. Air should be warm and moist enough to prevent electricity from affecting operations.

Lastly, the weighing of finished laps is a matter of constant record to the well-managed plant. The system which is most satisfactory is to have printed slips with four columns. The second column is for all laps weighing the standard required. The third column is for laps weighing heavier, and the first column for those weighing lighter. No laps are used that weigh one pound heavier or lighter than the standard. All that is necessary to do is to enter a mark in the proper column when each lap is weighed, and the most illiterate can be taught to keep a correct record of the laps. The well-trained lapper tender will make very few "off"laps.

However, when there is a quantity of either too light or too heavy laps, care is taken not to use more of one than of the other at the same time on the cards to keep the work even.

The record of these laps is turned over to the overseer every night, who in turn must indorse and send to the superintendent. This places the number keeping of the opening department under careful supervision, and is of vast importance to all subsequent processes.

The matter of help in the opening department is a matter that the successful superintendent courts with zealous care. He makes it a point to secure the best help and to keep them. Continual changing of help in this department is disastrous to the success of the plant. Having put the cotton through the opening department under the most successful methods, we are now prepared to take up the carding of the stock.

Carding

The function of the card is not fully implied in the name. The carding engine not only lays the fibers straight, but removes a vast deal of fine dirt and short fibers that cannot be removed in the opening department. To accomplish this the card must be kept oiled, clean, sharp and properly set. The successful superintendent insists upon having high grade card grinders, those who know their trade with certainty, and can be trusted to perform their duties. The expert grinder will grind lightly so as not to burr or hook the points of the clothing on the doffer and cylinder. The top flats are ground more heavily so as to give the wire a coarser point to hold the short fibers and leaf stripped from the cylinder. All grinders are supplied with standard gauges so that uniform setting of cards is carried on. The doffer is set to cylinder seven-one-thousandths of an inch apart on ordinary work. If only long staple or coarse heavy staple cotton is used it will be necessary to set them farther apart. Top flats, licker in, and feed rolls are set to gauge of nine-one-thousandths to eleven-one-thousandths inch. Heavy laps not over 14 ounces per yard and long draughts (about 95) fast doffer and light sliver of about 64 grs. per yard are the

best rules to follow. Doffers and cylinders are stripped often enough to prevent clothing from becoming clogged with lint, leaf and other waste substances. The cans are not left to pack too full, as this will strain the sliver. Cards that are thus cared for; that are on properly supported floor and free from vibration; level, all air vents closed; feed rolls properly weighted to prevent laps from being drawn between feed rolls faster than their surface speed, laps that are driven so as to avoid straining or splitting, will make even, clean sliver that can stand or bear the closest inspection of the severest critics. The overseer will scrutinize each card daily to make sure that each is making a smooth and perfect work.

Sliver Lap, Ribbons and Counters

In a very fine goods mills, there will be the sliver lap, ribbon winders and combers to look after. All these machines must be extremely well adjusted, oiled with great care, and the parts or surfaces upon which the sliver moves must be kept scrupulously clean and highly polished. Well trained help on these machines is imperative.

Drawing Frames

Modern mills having all the latest improved machinery and under excellent management usually dispense with the railway head, which is a form of drawing frame with evener attachment. Work made under the advantages already described does not require railway heads to even it. However, what is said about drawing frames in this article can apply with equal force to the care of railway heads or methods of operating them. Drawing machines appear very simple, and seem so easy to operate that they are often left to take care of themselves, and are operated with the poorest help in the mill.

But the successful superintendent is alert to the needs of these often forsaken drawing frames. He treats them with as great care as he does the opening machinery. In the first place, he places reliable help on them and pays well enough

to make it an object for them to remain at their post and cultivate the merits of an important work. The drawing machine is more than a drawing or doubling machine. It is an equalizing or averaging machine, and unless it receives the care it deserves the object of this process may be entirely defeated and deliver the work worse than when it received it. These machines will do superior work when the front, back, and full can stop-motions are kept in good working order. Every Saturday they are taken down and thoroughly scoured. The steel rolls are kept clean and brightly polished to prevent lapping. Five dublings into one with draught of no more than five and three processes of drawing will give best even results. The well-trained hands will never pass single work, and will take care to make smooth splicings, and keep the clearers picked at least every two hours. The speed of front rolls should not exceed 400 revolutions per minute to insure good work.

The weighing of finished drawing sliver twice a day is of vital importance. This is done on grain scales that weigh tenths of a grain.

Not less than one yard of sliver from each delivery of the last process of drawing is weighed twice a day, and the weights of each kind of goods is averaged, recorded and filed as shown by sample report.

WEIGHT OF FINE DRAWING SLIVER.

Date.....

Standard weight per yard, 68.

	A. M.				P. M.			
No. of drawing frames..	1	2	3	4	1	2	3	4
	68				69			
	68.1				69			
	68.3				68.9			
	68				69			
	68				69			
	68.2				68.6			
Averages.....	68.1 grs.				68.9 grs.			
Condition of weather.....	Dry.				Damp.			
Changes...	Gears not changed.				Gears not changed.			

Roving Frames

The most important matters the successful superintendent follows up in connection with these machines are the twist, tension, piecing ends, and creeling. The twist, he requires should be sufficient to hold stock intact, and yet leave the goods flexible enough to allow the successive processes to draw it well and not break back in the creels.

The tensions are gentle enough to avoid possibility of stretching roving. The ends are never taut and move with a slight sag. Piecings must be done without making lumps or hard twisted spots or lengths. In creeling, all single must be removed as well as doublings whenever made. Ends should be pieced at the steel roll and not at the bobbin, i. e., instead of threading the roving down through the flyer and pieced at the bobbins; it must be the natural roving (without twisting by hand) threaded from the bobbin up and pieced at the rolls.

Spinning Department

The preceding processes having been carried forth under the most favorable methods, a great deal of hard work is eliminated from the spinning department. The yarn will be smooth, clean, and of even numbers, providing that the rolls are kept clean, properly oiled and properly spread. The method of keeping spinning frames in proper order is to take one frame at a time and set the spindles, thread guides, rings, at least once a year. Besides this the frames are scoured at least twice a year. The spinners are required to make smooth piecings, and keep frames clean.

The important matter of production is accomplished by keeping every spindle making yarn, and the doffers are required to keep the frames doffed rapidly, so that the belts are on the tight pulleys the largest possible amount of the time.

The keeping of numbers or sizing the yarn receives the most careful inspection once a day. Weighings are taken out at random, and of samples sent from the carding department, and no less than eight bobbins of each are weighed. The random size is for comparison and is a check on the

regular test sent from the carding department. Each skein is also tested to ascertain the average strength of the yarn. The whole is tabulated as shown by sample report, which should be in triplicate, one copy of which is sent to the superintendent's office, another to the overseer of carding, and one is retained and placed on file in the spinning department.

YARN SIZE REPORT.

Date.....

Condition of the weather.....Fair.

Changes made.....No gears changed

No 60 Regular.			No. 60 at Random.		
Grs.	Size.	Strength.	Grs.	Size.	Strength.
16.4	60.98	31.2	16.2	61.73	30.5
16.6	60.24	31.7	16.3	61.35	30.8
16.5	60.61	31	16.7	59.88	32
16.7	59.88	32	16.8	59.52	32.8
16.5	60.61	31.3	16.5	60.61	30.7
16.5	60.61	31.2	16.4	60.98	31.3
16.8	59.52	32.4	16.5	60.61	31
16.4	60.98	31.1	16.4	60.98	31.7
Average	60.43	31.49		60.71	31.35
Lightest	60.98	31		61.73	30.5
Heaviest	59.52	32.4		59.52	32.8
Variation	1.46	1.4		2.21	2.3
Standard	60.25	31.9		60.25	31.7

The superintendent insists upon having this style of report because it keeps the faculty in touch with all the phases of the question and puts a premium upon closest keeping of numbers.

The condition of the weather is stated because this affects the numbers keeping more or less and a record of the matter often clears up a tangle in searching the file and explains the whys and wherefores or some variations.

Spooling, Warping, and Slashing

During these processes special attention is given to prevent straining the yarn when drawing same from bobbins to spools, from spools to beams and from beams to loom warps. All the elasticity of the yarn that it is possible to save is

kept for the looms. At the spoolers, great care is exercised to make small and perfect knots. These are now made by machines for the purpose, and they are kept in perfect working order. At the warpers all ends are kept straight without variance.

At the slashers the yarn is given a light but strong flexible size that will carry the stock through the looms without chafing or being too brittle.

The slashers are more successfully operated when a book is kept containing data complete concerning weights of yarn before and after slashing, wastes made, etc.

Weaving Department

The successful superintendent makes so much of his yarn preparation departments, and has been so precautious in regard to removing everything that makes defective yarn that the weaving of same into cloth is the most successful operation sought.

In this department, as in all other departments, his aim is to have the best help obtainable. For overseers he has clean, practical men who are with the company to stay and take strong interest and deep pride in serving the company with every honorable advantage known to the art. They are gentlemen of irreproachable character and surround themselves with help that are ambitious and make good work. These are the methods inculcated by the successful management, and first-class results are inevitable. And this applies with special force to the weaving departments. Everything that can be done to perpetuate high grade, full production, at lowest reasonable cost has perfect sway. Plenty of light, clean, whitened walls, clean water to drink, proper temperature, good air, sanitary department orderly, sufficient time for help to go home and enjoy a warm dinner—all these great advantages are as important to the successful working of the mill and receive as careful thought as do the speed of looms and the picks per inch in the cloth.

Another very important matter is the loom fixing, which must be done by tireless, courteous, competent loom fixers.

To have hustling good men in charge of the various sections is the pride of the methodical superintendent. With him these are points that materialize and are counted in as valuable assets in producing the highest percentage of best selling grades of cotton goods. And these goods have the right feel and are their own best trade-mark. They become known to the trade as reliable goods is what makes some mills so much more successful than those which plod along carelessly disregarding some of the most vital requirements herein mentioned.

Another chief method of this kind of a mill is the recognition of meritorious service and promoting men from the ranks when opportunity offers. This also lends impetus and incentive for the help to excel in their work.

The matter of supplies for the weaving department, as elsewhere, are judiciously chosen, and superior qualities are the only goods sought.

Keeping up reasonable repairs, and replacing antiquated machinery with modern improvements is the successful man's pride.

THE VALUE OF AN EXPERIENCED SUPERINTENDENT

Experience prevents many mill troubles. There is an old wise saying that "a stitch in time saves nine." There is another, which reads that "an ounce of prevention is worth a pound of cure." In no avocation can this advice be taken with greater profit than in the textile industries. That many men owe the success which crowns their efforts to prevention of costly and ruinous expenses, is as true as of those who have won their laurels by other accomplishments. To be tactful, precautious, and have the foresight to prevent disastrous events, is a characteristic which is worth cultivating by any man who courts a responsible position. Experience is what counts, and the superintendent who has had plenty of experience has a great advantage for the company he serves and for himself.

To exemplify this kind of service so that the thoughtful reader may understand and be instructed, if heeded, let us follow the man who carries the full drift of this advice with him all the time, and see how he prevents trouble.

We will take the superintendent of a textile plant for an example and see how he applies the ounce of prevention. Watch this man going to see his mills start in the morning. He is all eyes; all ears; and has the refined scent of a hound. He may have had five to ten years' experience as a superintendent, and has brushed against all the ordinary emergencies that arise. He knows the complete value of precautionary methods. He never takes any chances, and takes the surest way to accomplish all his objects.

On his way to the mill he perhaps notices that there is a little water oozing from the embankment of the mill dam. He realizes instanly that a leak in the dam is a serious thing. No time must be lost; for in a short time it may take thousands of dollars to repair a break that might result from neglect of the small leak. He prevents a costly experience by ordering the water drawn from the reservoir, and has the leaky premises fortified for a few dollars.

In the mill he notices, perhaps, that there is sign of weakness in a certain shaft which may break any time. He wires dimensions ahead for a duplicate, or stronger substitute, and installs it at the earliest possible moment available and prevents an accident, possibly a prolonged stoppage of the mill, and costly repairs besides.

This is his policy every day, all through the mill, and he trains his subordinates to never turn a deaf ear to any sound that means a warning.

There are many other instances that could be related of where prevention is success. As "it is the last straw that breaks the camel's back," so it may be one idle spindle that will ruin the firm. If one spindle is allowed to remain idle, it may lead the help to become careless and allow hundreds of spindles to be stopped until it becomes as serious as the leak in the dam—sweeping all the profits into the water. (That is what makes watered stock so perilous.)

The unruly tongue of a vicious hand may set all the help on fire and drive a firm to the wall. The same moral applies here—discover the evil promptly and discharge the evil worker. To allow an individual to have a "soft snap" may unsettle the thrift of the entire force. Let none come short of earning what they are paid for, otherwise there may be a much reduced efficiency in general, and the firm be driven to reduce wages, making a bad matter worse.

Thus it can be readily understood by the intelligent reader why it is that the experience of a precautious superintendent is worth so much more to a corporation than a man who simply knows (?) it all, but lacks foresight and precautionary methods. That a mill whose executive force is organized on this basis can make more money than a plant whose officials are wasteful and let themselves be overtaken by accidents, which could be avoided, is reasonable to expect. This may explain in a measure the difference between some paying plants and some that merely drag along.

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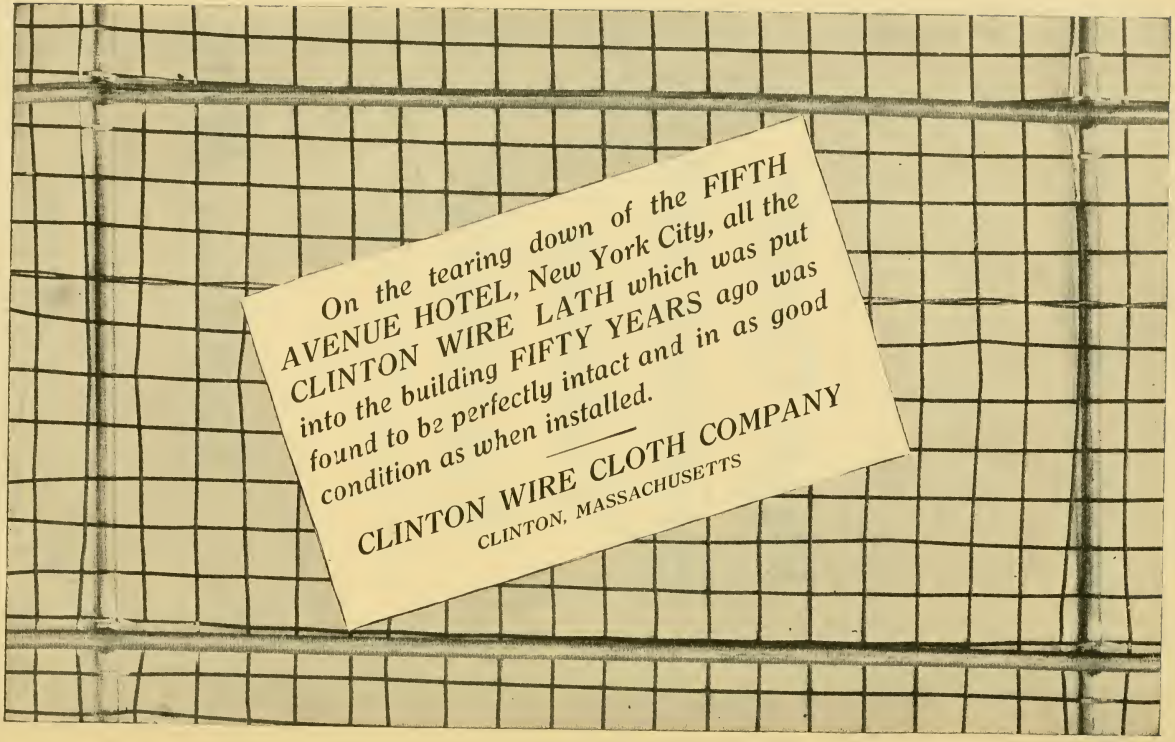
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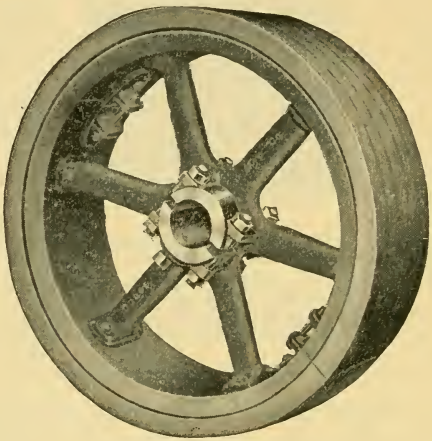

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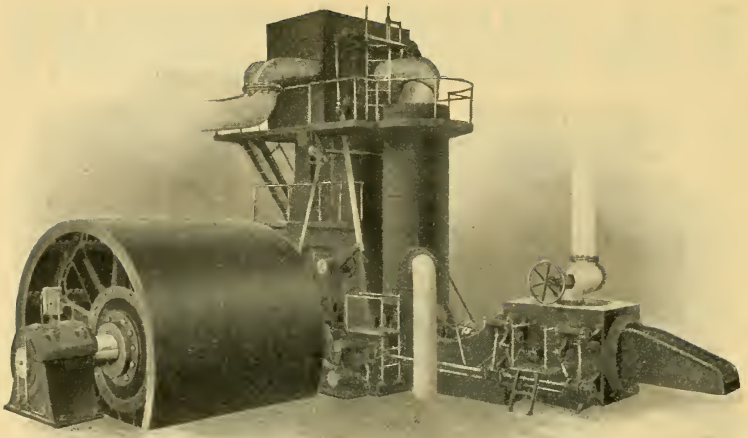

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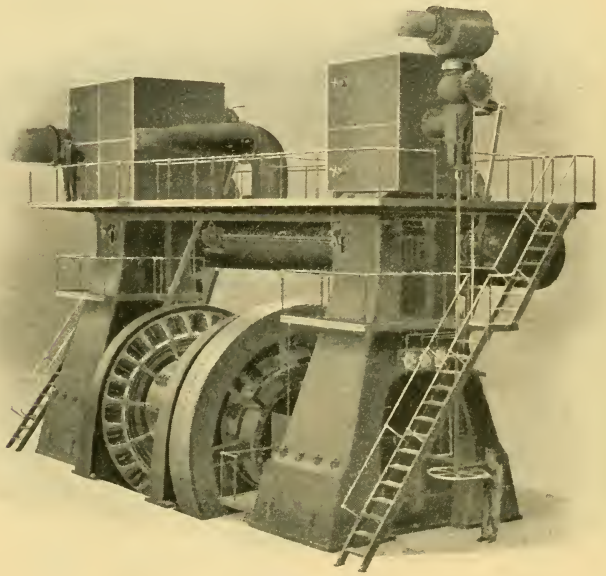

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